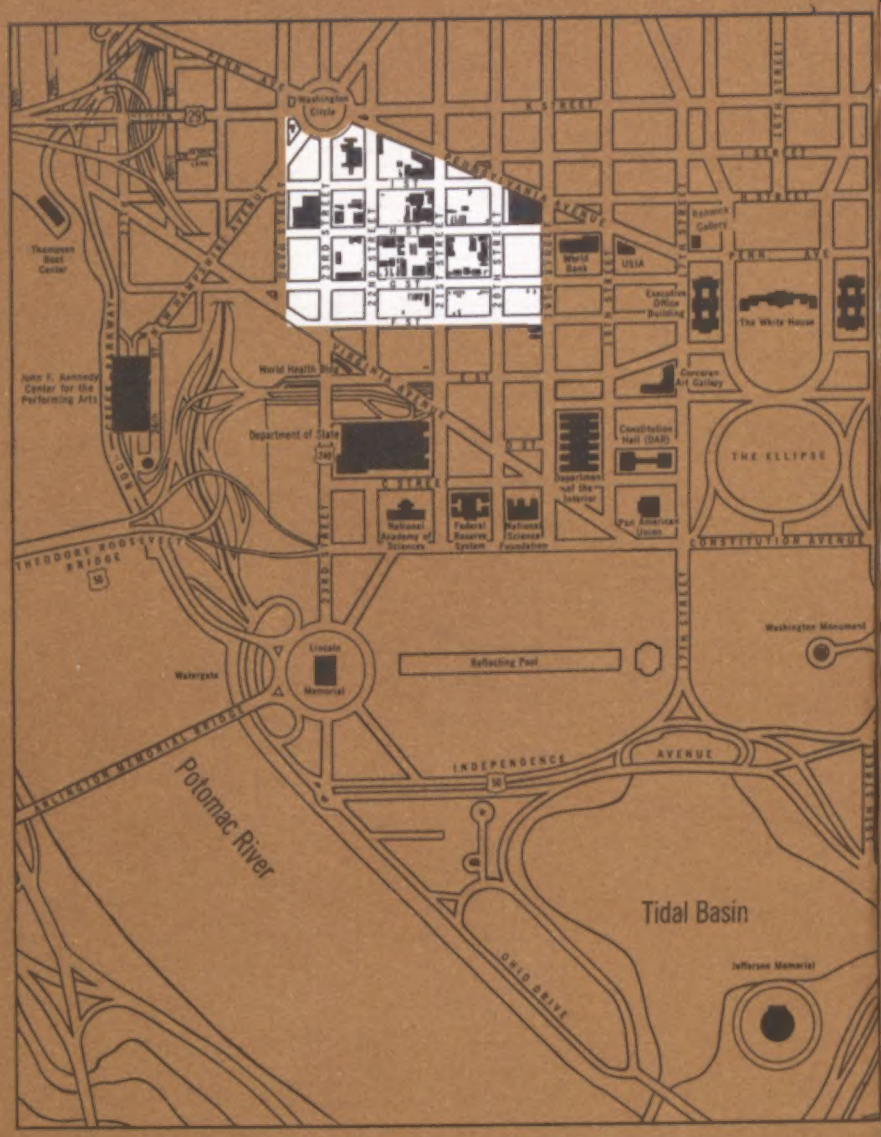
The George Washington University Bulletin

VOLUME LXXVI, NUMBER 3, MAY 1977



UNDERGRADUATE AND GRADUATE PROGRAMS

1977-78



THE GEORGE WASHINGTON UNIVERSITY CAMPUS/WASHINGTON, D. C.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN

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THE GEORGE WASHINGTON UNIVERSITY BULLETIN

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UNDERGRADUATE AND GRADUATE PROGRAMS 1977-78

ARTS AND SCIENCES, EDUCATION, GOVERNMENT AND BUSINESS ADMINISTRATION, PUBLIC AND INTERNATIONAL AFFAIRS

This *Bulletin* lists the programs and faculties of Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Education, the School of Government and Business Administration, the School of Public and International Affairs, and the Division of University Students.

For information concerning the School of Engineering and Applied Science, the National Law Center, the School of Medicine and Health Sciences, the College of General Studies, or the Summer Sessions, please request the appropriate bulletin.

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1977 **1978**

AUGUST

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1977 FALL SEMESTER

August 29 Orientation begins for students from foreign countries and for freshmen who did not attend Summer Advance Registration Program

August 30 Placement tests and advising for entering freshmen who did not attend Summer Advance Registration Program

Orientation begins for transfer students

August 31 Placement tests and advising for transfer students

Advising for sophomores, juniors, and seniors in the School of Government and Business Administration

† *September 1-3* Registration; application for February graduation due as part of registration

September 5 Labor Day (holiday)

September 6 On-campus classes begin

* This calendar is subject to change.

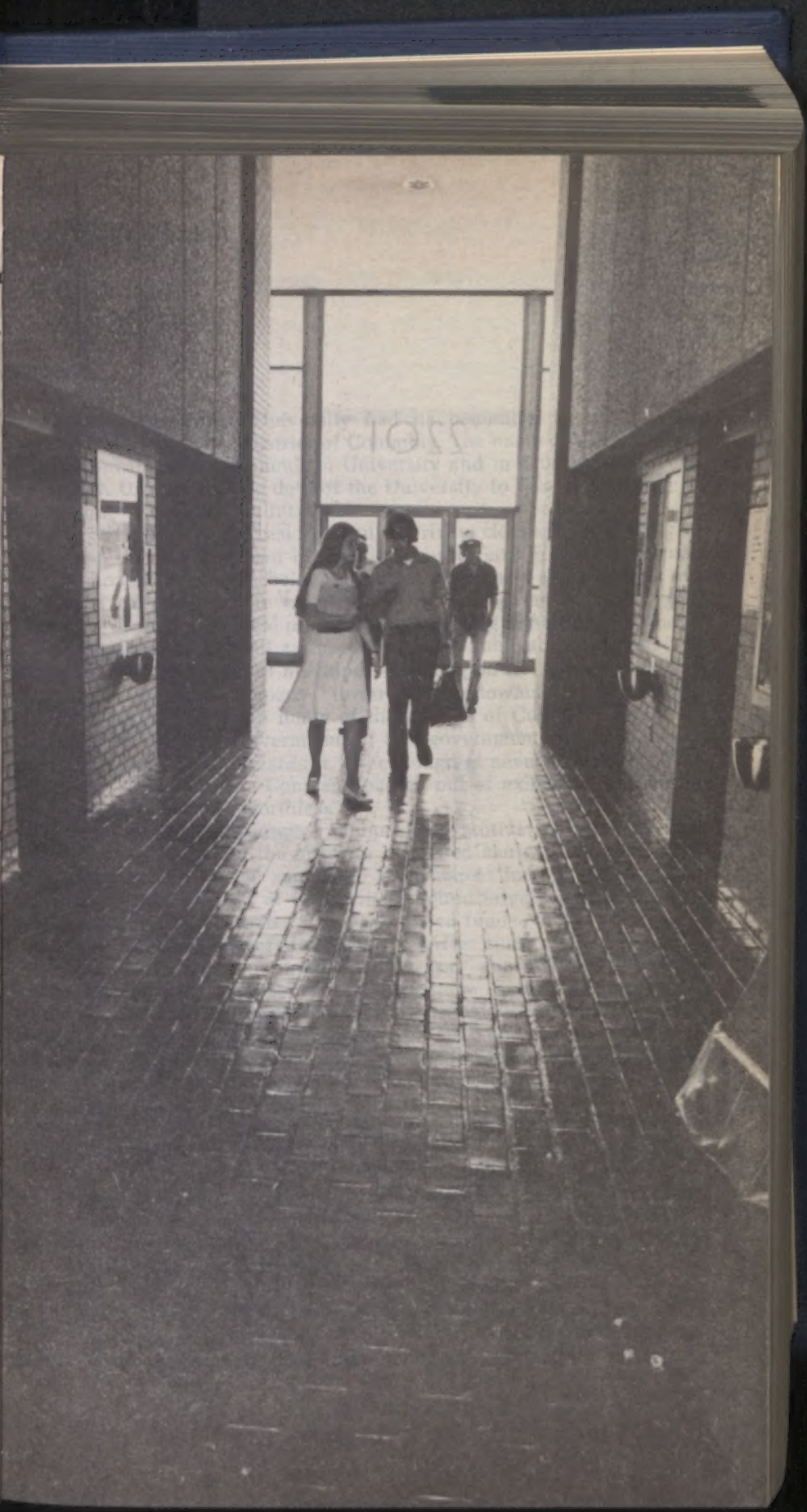
† The registration procedure and the hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

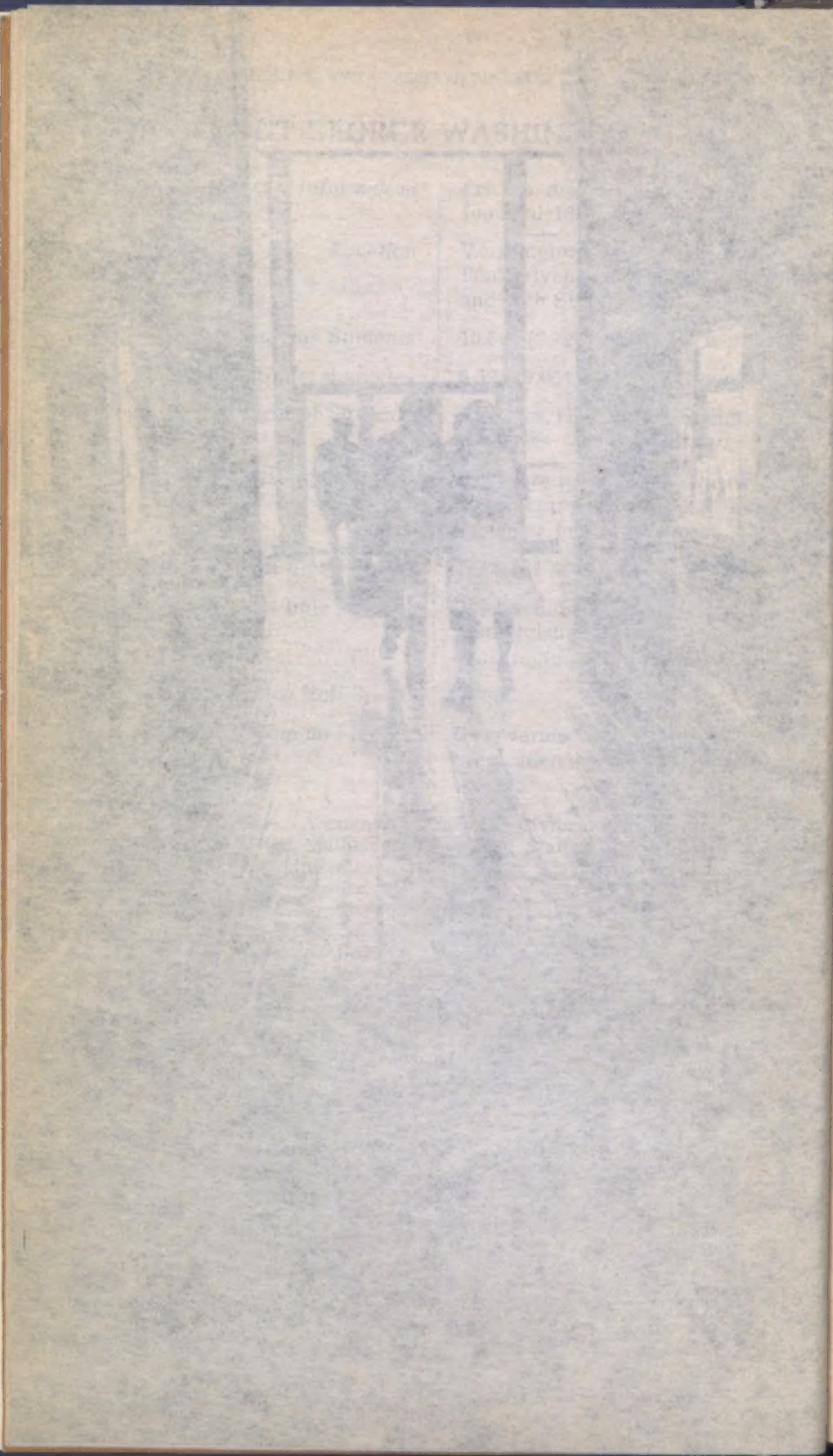
FACTS ABOUT GEORGE WASHINGTON UNIVERSITY

General Information	Private, nonsectarian, coeducational, founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-campus Students	16,563 (9,793 men, 6,770 women)
On-campus Undergraduates	5,572 (3,051 men, 2,521 women)
Geographical Origin of Students	50 states, District of Columbia, 147 countries
1977-78 Tuition	Undergraduate: $2,800 for two semesters; graduate: $105 for each semester hour (see pages 28-29)
Number of Full-time Faculty	1,000 (81% with doctoral degrees)
Number of Part-time Faculty	390 (includes some of the most distinguished men and women in Washington)
Residence Hall Space	2,130
Room and Board	Cost varies from $1,690 to $2,020 fo the academic year (see page 60)

Undergraduate majors: Accounting, American Civilization, American Literatur Anthropology, Applied Mathematics, Applied Statistics, Art History, Biology Botany, Business Administration, Cartography, Chemistry, Chinese Languag and Literature, Civil Engineering, Classical Archeology and Anthropology Classical Archeology and Classics, Classical Humanities, Computer Science Dramatic Art, East Asian Studies (China and Japan), Economics, Electrica Engineering, Elementary Education, English Literature, Environmental Studie Fine Arts, French Language and Literature, Geodesy, Geography, Geology Germanic Languages and Literatures, History, Human Kinetics and Leisur Studies, International Affairs, Journalism, Judaic Studies, Latin America Studies, Law Enforcement, Mathematical Statistics, Mathematics, Mechanica Engineering, Medical Technology, Middle School Education, Music (Applied History and Literature, Theory), Nursing Anesthesia, Nurse Practitione Program, Oceanography, Philosophy, Physician's Assistant Program, Physic Political Science, Premedicine, Psychology, Public Affairs, Radiologic Science and Administration, Religion, Russian Language and Literature, Russian Litera ture and Culture—in Translation, Secondary Education, Sociology, Spanis American Literature, Spanish Language and Literature, Speech Communicatio and Broadcasting, Speech Pathology and Audiology, Urban Affairs, Zoology

Study leading to graduate or professional degrees is offered in the Graduat School of Arts and Sciences, the National Law Center, the School of Medicin and Health Sciences, the School of Engineering and Applied Science, the Schoo of Education, the School of Government and Business Administration and th School of Public and International Affairs.





THE UNIVERSITY

HISTORY

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company, "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended a "fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to

the University. President Monroe, who signed the Charter, lived at 2017 E Street. The first President of the Board of Trustees, the Reverend Obadi B. Brown, was for fifty years the pastor of a church at Nineteenth and E Streets, and Washington selected Twenty-third and E Streets as the s of the National University he hoped to see established.

PURPOSE AND OBJECTIVES

The purpose of The George Washington University was to realize "t aspirations of Washington, Jefferson and Madison, for the erection of university at the seat of the Federal Government." Over the years it h been the aim to develop the University ideal in the nation's capital with view toward meeting the changing needs of society while continuing pursue the traditional principles of learning and research.

The George Washington University now rededicates itself and all t resources at its command to the pursuit of knowledge and its dissemin tion.

To this end:

The University recognizes its special opportunities in and obligations one of the principal capitals of the world. It is a primary objective of t University to utilize its historical, geographical, and functional relatio ship to the nation's capital and the Washington community in continuin the development of a great nationally and internationally oriented un versity.

The University recognizes the needs of our times and accepts the cha lenge to develop each student's potential abilities to the fullest exten

The University is and should remain privately controlled, nonsectaria and coeducational.

Admission to the University is determined only in terms of the pe sonal character and academic qualifications of the candidates.

A broadly based liberal education is fundamental to the total progra of the University.

Expansion of graduate and professional studies and research and th utilization for this purpose of the excellent research facilities and mat rials available in the nation's capital are basic to the continuous d velopment of the University's educational program.

The provision of superior instruction and facilities and the applicatio of high standards of entrance qualifications and academic achievement all students whether full-time or part-time, on-campus or off-campus, a major missions of the University.

A balanced program of student extracurricular activities is an integr part of the University program.

The University will continue to strive to meet the evident needs of a enlarged student body while governing the size of enrollment by i capacity to supply adequate staff and facilities for the excellent teachi and research which it espouses.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes 12 colleges, schools and divisions, as follows:

*Columbian College of Arts and Sciences** offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts and Bachelor of Science. The College also provides prelegal and premedical programs, and the preprofessional work required for admission to the School of Public and International Affairs. Columbian College has academic jurisdiction over the off-campus programs leading to the degrees of Associate in Arts in General Studies, Bachelor of General Studies, Bachelor of Science in Geodetic and Cartographic Science and Bachelor of Science in Oeanography. These off-campus programs are administered by the College of General Studies.

The Graduate School of Arts and Sciences†‡* offers advanced study and research leading to the degrees of Master of Arts, Masters of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science in Special Studies, Master of Science for Teachers, and Doctor of Philosophy. The degrees of Master of Arts in Special Studies and Master of Science in Special Studies are also available through off-campus programs administered by the College of General Studies.

The School of Medicine and Health Sciences†* offers work leading to the degrees of Associate in Science, Bachelor of Science, and Doctor of Medicine.

The National Law Center‡* offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science; and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, electrical engineering, and mechanical engineering. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the College of General Studies.

The School of Education offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Bachelor of Science in Human Kinetics and Leisure Studies; graduate studies leading to the degrees of Master of Arts in Education, Master of Arts in Teaching, Education

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* Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

† The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Master of Science and Doctor of Medicine and a dual program leading to the degrees of Doctor of Medicine and Doctor of Philosophy.

‡ The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

Specialist, and Doctor of Education. The degree of Master of Arts in Ed cation is also available through off-campus programs administered by t College of General Studies.

*The School of Government and Business Administration** offers unde graduate programs leading to the degrees of Bachelor of Business A ministration and Bachelor of Science in Health Care Administratio graduate programs leading to the degrees of Master of Arts in Gover ment, Master of Arts in Health Care Administration, Master of Busine Administration, Master of Public Administration, Master of Urban a Regional Planning; the Post-master's Graduate Certificate in Health Ca Administration; the degrees of Doctor of Business Administration a Doctor of Public Administration. The School also has academic jurisdi tion over off-campus programs leading to the degrees of Bachelor Science in Administration and Master of Science in Administration. The off-campus programs are administered by the College of General Studie

*The School of Public and International Affairs** offers undergradua programs leading to the degree of Bachelor of Arts and graduate progra leading to the degree of Master of Arts. The School also offers an o campus program leading to the degree of Master of Science in Inte national Affairs.

The College of General Studies supplements the adult education pr gram of the University through campus and off-campus study; confe ences, seminars, and special projects; and continuing education and no credit programs. This College also administers the off-campus progra over which Columbian College of Arts and Sciences, the Graduate Scho of Arts and Sciences, the School of Engineering and Applied Science, t School of Education, and the School of Government and Business Admi istration have academic jurisdiction.

The Division of University Students makes available courses for st dents not candidates for degrees in this University.

The Division of Experimental Programs.

The Summer Sessions.

ACADEMIC STATUS

George Washington University is accredited by its regional accreditin agency, the Middle States Association of Colleges and Secondary School

The University is on the approved list of the American Association University Women and is a member of the College Entrance Examinatio Board.

The National Law Center is a charter member of the Association American Law Schools and is approved by the Section of Legal Educ tion and Admissions to the Bar of the American Bar Association. Th School of Medicine and Health Sciences is a member of the Associatio of American Medical Colleges and is one of the medical colleges whic have been continuously approved by the American Medical Associatio

* The National Law Center cooperates with the School of Public and International Affairs, t Graduate School of Arts and Sciences, and the School of Government and Business Administr tion in offering a program leading to the combined degrees of Juris Doctor and Master of Ar

Curricula of the School of Engineering and Applied Science in civil, electrical and mechanical engineering are accredited by the Engineers' Council for Professional Development. The School of Education is a charter member of the American Association of Colleges for Teacher Education and is accredited by the National Council for Accreditation of Teacher Education for its bachelor's and master's degree programs. The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and the Certified Management Accountant professional examinations. The program in hospital administration is accredited by the National Accrediting Commission on Graduate Education for Hospital Administration. The Master of Urban and Regional Planning degree program is recognized by the American Institute of Planners. The Department of Chemistry is on the approved list of the American Chemical Society. The graduate program in clinical psychology in the Department of Psychology is on the approved list of the American Psychological Association. The program in speech pathology and audiology is accredited by the Education and Training Board of the American Boards of Examiners in Speech Pathology and Audiology.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

In accordance with the stated policy of its Board of Trustees and in conformity with federal laws and regulations, George Washington University does not discriminate against any person on the bases of sex, race, color, religion or national origin in any of its education or employment programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 call for an explicit statement that the requirement not to discriminate on the basis of sex extends to employment in and admission to such programs and activities.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office of Civil Rights of the Department of Health, Education, and Welfare.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the United States Information Agency, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, the General Services Administration, the National Academy of Sciences, and the John F. Kennedy Center for the Performing Arts.

THE UNIVERSITY LIBRARIES

The library collections of the University are housed in the Universi Library (the general library of the University) and in the libraries of t Institute for Sino-Soviet Studies, the National Law Center, and the Scho of Medicine and Health Sciences.

These collections contain approximately 700,000 volumes, to which a added some 40,000 volumes a year. Endowments supplementing the Un versity appropriation provide books in the fields of American civilizatio American literature, foreign service, history, public finance, and the soci sciences; and gifts from many sources have enriched the collections. T libraries currently receive about 7,500 periodicals.

Information concerning the use of the libraries may be obtained at t library service desks.

The library is administered for the curricular, reference, and recre tional needs and interests of the students. Instruction in the use of t library is given upon request by the reference librarians. The library e deavors to assist students and all members of the University to use t rich library resources of Washington and the unusual opportunities th offer for extensive research. Interlibrary loan arrangements are mai tained with other libraries in the city and thoughout the United States.

The student has access to the Library of Congress, the Public Libra of the District of Columbia and its branches, and many of the speci collections of the government departments. Graduate students at Geor Washington University may, upon application, be issued a Consortiu library card which permits direct borrowing from the libraries of t other Consortium Institutions.

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Philip Stanley Birnbaum, M.S. in M.E., B.C.E., *Dean for Administrative Affairs of the Medical Center*
Dennis Sophian O'Leary, B.A., M.D., *Dean for Clinical Affairs of the Medical Center*
Lawrence Thompson Bowles, B.A., M.S., M.D., Ph.D., *Dean for Academic Affairs of the Medical Center*
Robert Kramer, B.A., LL.B., *Dean of the National Law Center*
Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied Science*
Rodney Tillman, Ed.D., *Dean of the School of Education*
Peter B. Vaill, B.A., D.B.A., *Dean of the School of Government and Business Administration*
Burton Malcolm Sapin, Ph.D., *Dean of the School of Public and International Affairs*
John Gage Allee, Jr., Ph.D., *Dean of the Division of University Students*
Robert Lee Holland, Ph.D., *Dean of the College of General Studies*
William Francis Edward Long, Ph.D., *Dean of the Summer Sessions*
Roderick Stuart French, Ph.D., *Director of the Division of Experimental Programs*
Fred Leonard, Ph.D., *Associate Dean for Research of the Medical Center*
Michael McCally, M.D., Ph.D., *Associate Dean for Allied Health Programs of the Medical Center*
Robert Keimowitz, B.A., M.S., M.D., *Associate Dean for Student Affairs and Admissions, Medical Center*
W. Wallace Kirkpatrick, B.A., LL.B., *Associate Dean of the National Law Center*
Edward Andrew Potts, B.A., LL.B., *Associate Dean of the National Law Center for Graduate Studies, Research, and Projects*
Harry Robert Page, Ph.D., *Associate Dean for Academic Affairs of the School of Government and Business Administration*
Charles McKay Chambers, Ph.D., *Associate Dean of the College of General Studies*
Alvin Carl Jensen, Ed.D, *Associate Dean of the College of General Studies*
Calvin Trexler Klopp, B.A., M.D., *Medical Director of the University Clinic*
Barbara Joan Dunham, M.A., *Assistant Dean of Columbian College of Arts and Sciences*
Joseph Louis Métivier, Jr., M.A., *Assistant Dean of Columbian College of Arts and Sciences*
Robert Clinton Rutledge, Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*
Harry Elwood Yeide, Jr., Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*

Avery Delano Andrews, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
Edward Alan Caress, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
David Alton Rowley, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
Winfield Harker Scott, Ph.D., *Assistant Dean for Education and Director of Education of the Medical Center*
Robert James Van Houten, M.D., *Assistant Dean of the Medical Center for Graduate and Continuing Medical Education*
James Elmer Feir, Ph.D., *Assistant Dean of the School of Engineering and Applied Science*
Robert Edward Baker, M.A., Ed.D., *Assistant Dean of the School of Education*
Kurt John Darr, J.D., D.Sc., *Assistant Dean of the School of Government and Business Administration*
John Lobuts, Jr., B.S., Ed.D., *Assistant Dean of the School of Government and Business Administration*
Bjorn Karsten Netland, M.A., *Assistant Dean of the Division of University Students*
Ruth H. Osborn, Ed.D., *Assistant Dean of the College of General Studies for Continuing Education for Women*
Salvatore Rocco Paratore, B.A., M.S., Ph.D., *Assistant Dean of the Summer Sessions*

COMMITTEES OF THE UNIVERSITY 1976-77

Committee on the Judicial System: G.J. Ginsburg *(Chairman)*, M.G. Gallagher, L.P. Ribuffo, Three Student Members

Student-Faculty Committee on Appeals: R.S. Kuhn *(Chairman)*, R.N. Dunn, J.C. Heddesheimer, N.K. Khatcheressian, Four Student Members

Committee on Religious Life: J.G. Boswell *(Chairman)*, R.H. Davison, J.A. Greenberg, R.G. Jones, R.E. Kennedy, Jr., H.M. Sachar, Five Student Members

Committee on Student Publications: A.E. Claeyssens, Jr. *(Chairman)*, G. Bodnar, S.W. Burks, L. Lesko *(ex officio)*, J. Murphy *(ex officio)*, F.J. Naramore *(ex officio)*, P. Robbins, W.F. Schmidt, H.E. Yeide, Jr., Six Student Members

Committee on the University Bookstore: R.F. Dyer *(Chairman)*, E.N. Albert, M.S. Hurwitz *(ex officio)*, J.K. Kern, R. Munt *(ex officio)*, Three Student Members

Committee on Federal Educational Allowances: H. Solomon *(Chairman)*, H.F. Bright, L.H. Elliott *(ex officio)*, W.D. Johnson *(ex officio)*, C.D. Linton

Committee on Research: H. Solomon *(Chairman)*, H. F. Bright, A.B. Cambel, R.H. Davison *(ex officio)*, J. Eisenstein, D.R.K. Henney, C.J. Lange, F. Leonard, M.N. Rashid, D.G. White

Committee on Sponsored Research: M. Ross *(Co-chairman, Student Member)*, R.E. Darcy *(Co-chairman)*, R.H. Davison, A.G. Hollinshead, C.J. Lange *(ex officio)*, F. Leonard *(ex officio)*, B.I. Levy, A.W. Reitze, G.W. Smith, Five Student Members

Committee on Research on Humans: J.W. Hillis *(Chairman)*, I.H. Cisin, R.H. Davison *(ex officio)*, C.J. Lange, B.I. Levy, A.E. Parrish, M.N. Rashid

Committee on Animal Facilities: D. Smith *(Chairman)*, E.N. Albert, E. Bradley, A.H. Desmond, C.J. Lange *(ex officio)*, F. Leonard *(ex officio)*, R.D. Walk, B.C. Zook

Committee on University Parking: J.C. Einbinder *(Chairman)*, V.H. Cohn, Jr., C.E. Diehl *(ex officio)*, R.R. Fox, J. Mello *(ex officio)*, R. Munt *(ex officio)*, D.C. Novak, M. Phelps, C.R. St. Cyr, J.H. Strandquist, Four Student Members

THE FACULTY SENATE 1977-78

Elizabeth Byrne Adams
Frederick Amling
*Philip Stanley Birnbaum
*Harold Frederick Bright
Roderic Hollett Davison
*Lloyd Hartman Elliott
Raymond Richard Fox
*Robert Gebhardtsbauer
Gilbert Jerome Ginsburg
Janet Craig Heddesheimer
Peter Proal Hill
Robert Gean Jones
John Kaye
*Robert Kramer
Frederick Charles Kurtz
Nicholas Kyriakopoulos
Lawrence Stephen Lessin
*Harold Liebowitz
*Calvin Darlington Linton
James Kenneth McDonald
†John Andrew Morgan, Jr.
Judith Ann Abrams Plotz
Martha Norman Rashid
John Palmer Reesing, Jr.
S. David Rockoff
*Burton Malcolm Sapin
Stefan Otto Schiff
Teresa Moran Schwartz
Lois Green Schwoerer
Jeanne Ellen Snodgrass
*Henry Solomon
*Rodney Tillman
*Peter B. Vaill
Glenn Anthony Walker
Reuben Esselstyn Wood
Elyce Zenoff
John Edmund Ziolkowski

O'Neal Smalls, *Parliamentarian*

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* Ex officio member
† Chairman of the Executive Committee

ADMISSION

The University accepts both men and women. Students are admitted at the beginning of each semester and summer session.

An application for admission to degree candidacy should be accompanied by a $10 (for undergraduate study) or $25 (for graduate study) application fee.* The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences, and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants are urged to submit the application form and complete credentials well in advance of the semester for which they seek admission. Specific dates are given in each section below.

The right is reserved to refuse admission to any student with an academic record which creates doubt of ability to succeed in college or who, for any other reason, would not be an acceptable student. In the selection process, there is no discrimination because of sex, race, color, religion, or national origin.

UNDERGRADUATE ADMISSION†

Forms for application for admission or readmission to undergraduate or nondegree status are available at and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Secondary School Students

Applicants who wish to begin college in the fall semester or in a summer session should apply during the fall term of the senior year in high school. Preference will be given to students who submit applications and required credentials prior to March 1. Students graduating at mid-year who wish to begin college in the spring semester should apply no later than November 1.

Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after September 1 to students whose applications become complete with secondary school records through the junior year and junior-year test scores, provided these records clearly establish admissibility.

Early Admission Plan—Unusually well-prepared students who have completed the junior year in high school may be considered for admis-

* Application fee must be by check or postal money order, payable to George Washington University.

† For detailed admission requirements, see the appropriate college or school in this *Bulletin*. Tests required for admission and test application information are described on page 24 and 31-32. See pages 25-27 for admission requirements for students from foreign institutions.

sion. This plan is designed for those students who, in terms of academic preparation and emotional maturity, are ready to enter college. More often than not, students interested in early admission have substantially exhausted the high school offerings in several academic areas. For such students, remaining in high school for the senior year would not be in their best interest, nor in the best interest of the school.

To be considered for early admission, students must:

1. meet most of the secondary school requirements for graduation and complete the University's required entrance units (see pages 68–69),
2. have the unqualified recommendation of the secondary school principal or counselor,
3. submit two letters of recommendation (in addition to the counselor's) from teachers who can testify to the student's maturity and general readiness to enter college,
4. submit SAT or ACT scores.

The student's chances for admission will be improved if scores of CEEB achievement tests or Advanced Placement Tests in subjects taken in the sophomore year are submitted.

Applicants from a secondary school must arrange to have sent directly from their schools to the Office of Admissions a complete academic record together with a personal evaluation and recommendation from the principal. This information should be supplied on a standard form used by the secondary school.

Transfer Students

Undergraduate transfer students from other institutions should submit application and required credentials prior to June 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions.

The transfer student must be in good standing as to scholarship and conduct. A student who has been academically dismissed or suspended more than one time normally will not be considered for admission.

An applicant who has attended one or more institutions of higher learning must request each registrar to mail directly to the Office of Admissions a transcript of his or her record, *even though credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (C or better in academic courses from an accredited institution) at the time the application is submitted, the applicant must request that his or her high school record and College Entrance Examination Board or ACT test scores be sent to the Office of Admissions.

If high school units are not shown on the college transcript, the applicant must request that the high school record be sent to the Office of Admissions.

Advanced Tuition Deposit

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students including those readmitted. This deposit is not due until May 1 for students entering in the fall semester or until December 15 for students entering in the spring semester. The deposit is credited toward tuition and is not refundable.

Advanced Standing and Advanced Placement

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through coursework or examination, advanced standing may be granted for work successfully completed at accredited institutions of higher learning. It will be granted only when it meets the requirements for the degree sought at this University and may be accepted provisionally. Work of low-pass grade (*D* or the equivalent) will not be considered for transfer.

Except for students transferring to the School of Government and Business Administration from a two-year or junior college, in which case no more than 60 semester hours of credit may be assigned, there is no strict limit to the total amount of credit that may be assigned. However, a student must satisfy the residence and course requirements for the degree sought at George Washington University.

CREDIT BY EXAMINATION

Assuming there is no duplication of coursework earned, a maximum of 30 semester hours of credit may be assigned upon admission to the University for each or any combination of the following except as noted:

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT TESTS (APT)

Credit is assigned for examinations passed with scores of four or five on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. Examinations passed with scores of three will be considered for credit or placement if the student arranges to have the examination paper sent to the Office of Admissions. The Advanced Placement Tests are administered in the secondary school in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Entrance Examination Board, Advanced Placement Tests, Box 592, Princeton, N.J. 08540, or Box 1025, Berkeley, Calif. 94701.

COLLEGE ENTRANCE EXAMINATION BOARD COLLEGE-LEVEL EXAMINATION PROGRAM (CLEP)

CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations, with the exception of the English composition examination,

assed at the 50th percentile or above (college sophomore norms). Credit assigned, with a few exceptions, for the Subject Examinations passed t the level recommended in the College Board model policy. A candiate for a degree from any school at this University must seek departaental approval *prior* to taking the examination to receive credit for a LEP Subject Examination. Credit may not be earned by passing the xamination after having taken the equivalent course. Arrangements for ae examinations are the responsibility of the applicant and should be ade with the College Entrance Examination Board College-Level Exmination Program, Box 1824, Princeton, N.J. 08540.*

PECIAL DEPARTMENTAL EXAMINATIONS FOR UNDERGRADUATES

xcept for students admitted to the School of Government and Business dministration, credit may be assigned for Special Departmental Exami-ations, see pages 75–76.

REDIT EARNED THROUGH UNITED STATES ARMED FORCES INSTITUTE (USAFI)

xcept for students enrolled in the School of Education or the School f Government and Business Administration, credit is assigned for pproved United States Armed Forces Institute college-level examinations assed with satisfactory scores.

REDIT FROM SERVICE SCHOOLS

xcept for undergraduates admitted to the School of Education or the chool of Government and Business Administration, a limited amount f credit may be assigned for selected service school instruction received ince 1941. No more than 30 semester hours may be assigned for a comination of service schools and examinations referred to above. Veterans hould submit to the Office of Admissions photostatic copies of their ervice school records, indicating courses successfully completed with ufficient identification of the course to locate it in the *Guide to Evaluation f Educational Experience in the Armed Forces*.

DVANCED PLACEMENT

dvanced placement or waiver of a requirement will be granted on the asis of scores on Achievement Tests of the College Entrance Examinaion Board as follows:

Achievement Test	Minimum Score	Exemption
nglish Composition	650	Waives Engl 10
nglish Composition	680	Waives Engl 11 or 12

*See page 176 for additional qualifications for applicants to the School of Government and usiness Administration.

European and/or American History	600	Waives Hist 39-40 and/or 71-72
French	650	Waives a two-year language requirement
German	600	
Hebrew	600	
Latin	600	
Russian	700	
Spanish	650	

GRADUATE ADMISSION*

Graduate School of Arts and Sciences—Forms for application for admission or readmission are available at the Office of the Dean of the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052. Completed applications and requests for fellowship support must be submitted by February 15 (February 1 for students in clinical psychology and art therapy) for admission in the fall semester and by November 1 for the spring semester. Applications for graduate study are acceptable after these dates for admission in the corresponding semester and will be reviewed if time permits and if space is available in the program desired.

School of Education—Forms for application for admission or readmission are available at the Office of the Dean of the School of Education, George Washington University, Washington, D.C. 20052. When completed these application forms should be submitted to this Office no later than June 1 for the fall semester, November 1 for the spring semester and April 1 for the summer sessions.

School of Government and Business Administration—Forms for application for admission or readmission are available at the Graduate Admissions Office, School of Government and Business Administration, George Washington University, Washington, D.C. 20052. When completed, application forms and supporting credentials for master's degree programs should be submitted to this Office no later than April 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions; those for doctoral programs should be submitted by March 1 for the fall semester, October 1 for the spring semester, and March 1 for the summer sessions. Applicants who received their undergraduate degrees from foreign universities must submit applications one month earlier in each case.

School of Public and International Affairs—Forms for application for admission or readmission are available at the Graduate Admissions Office, School of Public and International Affairs, George Washington University, Washington, D.C. 20052. When completed, these application forms should be submitted to this Office no later than March 1 (February 1 for applicants for graduate fellowships or assistantships and foreign applicants). Admission is for the fall semester only. All credentials, including transcripts from all institutions attended, Graduate Record Examination scores and letters of reference, must be received before the deadline date.

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* For detailed admission requirements, see the appropriate college or school in this *Bulletin*. See pages 25-27 for admission requirements for students from foreign institutions.

DIVISION OF UNIVERSITY STUDENTS ADMISSION

Forms for application for admission to *nondegree* status in the Division of University Students are available at and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052. When completed, these application forms, with credentials when required, should be received by the Office of Admissions no later than the Friday before the first day of registration (see Calendar, pages 5–7). To avoid paying a late registration fee, every effort should be made to insure that any required credential is in the Office of Admissions prior to registration. No fee is charged for application for admission to this Division. For detailed entrance requirements, see pages 175–76.

Registration in a given course may be denied students in this Division when space is needed for degree candidates.

READMISSION

A student previously registered in the University who was not registered on campus during the immediately preceding semester (summer session excluded), must apply for readmission. Final dates for applying are the same as those for "Undergraduate Admission" (see pages 20–21), or "Graduate Admission" (see page 24). If the student applies as a degree candidate and was previously registered as a nondegree student, or if a student has attended one or more higher institutions while absent from the University, the student must have complete official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time last registered at this University and who have not since registered at another institution.

STUDENTS FROM FOREIGN INSTITUTIONS*

Application, required records, and scores on the *Test of English as a Foreign Language* (see page 26) should be received from international students no later than March 1 (February 1 for applicants for graduate study in the School of Public and International Affairs) for the fall semester and October 1 for the spring semester.

George Washington University offers an English-language program for foreign students.

Required Records

At the time the application is sent, students must request the educational institution previously attended to send directly to the appropriate admissions office (see "Undergraduate Admission," pages 20–21, or "Graduate Admission," page 24), copies of official certificates and records listing

*For detailed admission requirements, see the appropriate college or school in this *Bulletin*

subjects studied, grades received, examinations taken and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies which are sent should be accompanied by an English translation.

Language Tests

Students whose native tongue is not English are required to take the Test *of English as a Foreign Language* (TOEFL). Students are responsible for making arrangements for taking the test by addressing inquiries to the following agencies:

1. All European countries (including Cyprus, Great Britain, Iceland, and Ireland):

   CITO
   Postbus 1034
   Arnhem, The Netherlands

2. All Middle Eastern and North African countries (except Israel):

   American Friends of the Middle East
   Abou Shakra Building
   Rue Bliss (Manara)
   Beirut, 2500 Lebanon

3. Hong Kong:

   Institute of International Education
   408 J. Hotung House, Fourth Floor
   5/15 Hankow Road, Kowloon, Hong Kong

4. India:

   Bureau of Educational Research
   Ewing Christian College
   Allahabad, U.P., 211003, India

5. Republic of China:

   Language Center, 2-1 Hsu-chow Road
   Taipei, Taiwan (100), Republic of China

All other applicants should address inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08540, U.S.A. The completed application form should be returned to the appropriate agency well in advance of the beginning of the semester for which the applicant seeks admission. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does not constitute application for admission to George Washington University.

The *Bulletin of Information*, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports and the conduct of the test; lists of examination centers; examination dates

d an application blank. On the application for the test, the student ould specify that the scores be sent to the appropriate admissions office this University (see "Undergraduate Admission," pages 20–21, or Graduate Admission," page 24).

In addition to the TOEFL, an admitted student is required to take test in English as a second language prior to registration. Results of s test will determine the courses the student will be permitted to register in the program of study. If the knowledge of English is inadequate enable the student to undertake any academic work, the student will t be permitted to register for any courses other than English and will required to study English on a full-time basis either at this University at a recognized language institution.

RANSFER WITHIN THE UNIVERSITY

r information concerning transfer from one college, school, or division to other within the University, see page 48.

EGISTRATION

e dates, hours, and place of registration will be stated in the *Schedule Classes*, which is available well in advance of each semester.

Students cannot register for on-campus classes without a letter of admission to the University issued by the appropriate admitting office.

No registration is accepted for less than a semester or one summer session.

Students may not register concurrently in this University and another stitution without the prior permission of the dean of the college, school, division in which registered in this University. Registration in more an one college, school, or division of the University requires the written rmission of the deans concerned, *prior to registration*. Allowance of edit for work done concurrently at another institution is at the discretion the appropriate committee.

igibility for Registration

gistration for the following categories of campus students is held on the ys of registration stated in the University Calendar. A student who is spended or whose record is not clear for any reason is not eligible to gister. Registration in a given course may be denied students in the vision of University Students when space is needed for degree ndidates.

New Student—Upon receipt of a letter of admission, the new student is gible for registration on the stated days of registration.

Readmitted Student—A student previously registered in the Universit who was not registered for campus courses during the preceding semest or summer session must apply for and receive a letter of readmission fro the appropriate admitting office before he or she is eligible for registratio

Continuing Student—The student registered for campus courses in t immediately preceding semester or the summer session preceding the fa semester is eligible to register assuming good standing and enrollment in continuing program.

Registration Changes and Withdrawals (See pages 47–48)

Registration for Consortium Courses

Degree students interested in taking courses at any of the other i stitutions in the Consortium of Universities of the Washington Metropolita Area, Inc. (see pages 53–54), should consult the program announcements the other institutions. Consortium application forms and instructions ma be picked up in the Office of the Registrar after obtaining registrati materials. In order to participate in the Consortium program, students mu obtain the approval of an advisor and should ascertain from the depar ment of the institution where the course is taught whether or not they a eligible for the course and whether there is space in the class. Specif inquiries should be addressed to the Registrar.

FEES AND FINANCIAL REGULATIONS

Fees paid by students cover only a portion of the cost of the operati of the University. Income from endowment funds, grants, and gifts fro alumni and friends of the institution make up the difference.

The following fees and financial regulations were adopted for the 19 summer sessions and the academic year 1977-78. (See page 31 for pr jected tuition increases for 1978-81.)

Tuition Fees

For undergraduate study in Columbian College of Arts and Sciences, the Scho of Education, the School of Government and Business Administration, t School of Public and International Affairs, and for courses taken on camp by undergraduate students in the College of General Studies:

Full-time program (12 or more semester hours) each semester	$1,400
Part-time program, for each semester hour	105
Summer Sessions, for each semester hour	98.0

or graduate study* in the Graduate School of Arts and Sciences, the chool of Education, the School of Government and Business Administration, and the School of Public and International Affairs: for ose registered in the Division of University Students; and for ourses taken on campus by graduate students in the College of eneral Studies:

For each semester hour for which a student registers	$ 105.00
niversity Center Fee (charged all students registered on campus,† nonrefundable)	
or students registered for 11 or more semester hours on campus:	
Each semester	50.50
or students registered for less than 11 semester hours in a semester n campus:	
For each semester hour for which the student registers	4.75
or students maintaining "continuous registration" status:	
Each semester	4.75

dditional Course Fees

certain courses additional fees, such as laboratory and material fees, are harged as indicated in the course descriptions. These fees are charged by the emester and unless otherwise indicated, may be defrayed in two payments hen the tuition is paid in this manner. Breakage of apparatus is charged gainst the individual student. When breakage is in excess of the normal mount provided for in the laboratory fee the individual student will be required to pay such additional charges as are determined by the department oncerned.

raduation Fees

ssociate in Arts	$10.00
achelor's, Master's, Education Specialist, Doctor's degrees	25.00
ost-master's Graduate Certificate in Health Care Administration	25.00
ee for binding master's thesis	10.00
ee for microfilm service and printing announcement of final examination (doctoral candidates)	60.00

esidence hall fees (see page 60)

pecial Fees and Deposits

pplication fee (undergraduate degree candidate), nonrefundable	10.00
pplication fee (graduate degree candidate), nonrefundable	25.00
dvanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
ousing deposit, nonrefundable, charged each applicant for residence hall space	100.00
dmission tests (when required)	6.00–12.00

Payment of tuition for a master's thesis entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time may be granted in accordance with the regulations of the school in which the student is registered.

†Students in the College of General Studies are charged the University Center fee only when registered for courses on campus.

National Teacher Examinations fee, for Bachelor of Arts in Education degree candidates	9.00–13.
Late-registration fee, for failure to register within the designated period	15.
Late-payment fee, for failure to make payments when due (see "Payment of Fees," pages 31–32)	15.
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," pages 31–32)	35.
Returned check fee, charged a student whose check is improperly drafted, incomplete, returned by the bank for insufficient funds, or for any other reason	15.
Continuous Registration fee, to maintain "continuous registration" status during any semester of absence from the University or after completion of tuition requirements*—due and payable on the official days of registration	105.
For special physical examination	2.
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.
For each waiver examination to qualify for advanced placement	5.
English test for foreign students (when required)	10.
Laboratory checkout fee, for failure to check out of chemistry laboratory by the date deadline set by the instructor†	10.
Transcript fee, for each transcript of record	2.
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2 each, fee for each additional copy	
Replacement of lost or stolen picture identification card	2.

Registration for on-campus courses in the University entitles each stude to the following University privileges: (1) the services of the Stude Career Services Office; (2) the use of the University Library; (3) gymnasiu privileges; (4) admission to all athletic contests, unless otherwise specifie (5) subscription to the *University Hatchet*, the student newspaper; (6) a mission to University debates; (7) medical attention as described und Student Health Service. These privileges terminate when the student wit draws or is dismissed from the University.

Postdoctoral Study

George Washington University doctoral graduates may continue any studi in the University without payment of tuition, and enjoy all Universi library privileges. Such graduates are required to pay the usual "continuo registration" fee and the University Center fee in order to establish the active membership in the University. The use of laboratory space a equipment is contingent upon availability, and the cost of all laborato or special library material is paid by the graduate. Special arrangemen

* Payment of the continuous registration fee entitles the student who is granted leave of sence to return and continue work toward a degree under the academic requirements wh were in force at the time of the student's first registration. The continuous registration applies toward neither tuition fee nor residence requirements for the degree.

This fee does not apply to students granted military leave, see page 49.

† A student who drops a chemistry course before the end of the semester must check out of laboratory at the next laboratory period.

uch privileges must be made with the dean two months in advance of semester in which the graduate wishes to register. Postdoctoral work n under this privilege may not be applied toward any degree offered by University.

ected Tuition and Fee Increases 1978-81

rder that students and their parents may plan more realistically for a four-year period, tuition increases for the academic years 1978-79, -80 and 1980-81 have been estimated as follows:

ease by year (full-time undergraduate students):

78–79	$200.00
79–80	200.00
80–81	200.00

ease by semester hour (graduate and part-time undergraduate ents):

78–79	5.00
79–80	7.00
80–81	8.00

is not possible to project future economic data with certainty. The eases outlined above are merely estimates based on present circumces and should in no way be interpreted as fixed limits on tuition eases. The University hopes to keep tuition increases as low as pos-, but it is obligated to maintain a sound financial basis. Economic ditions in the recent past, particularly as they affect private educational itutions, have been extremely variable, and significant increases in on in excess of the above limits may be required.

ment of Fees

student is permitted to complete registration or attend classes until all rges are paid. Tuition and fees for each semester are due and payable in at the Office of the Cashier at the time of each registration. Checks uld be made payable to George Washington University, with the lent identification number in the upper left-hand corner.

he Student Accounts Office has responsibility for billing and maintainstudent accounts for tuition, various fees, and room and board charges. tudent registered for six semester hours or more may sign a deferred ment contract with the Student Accounts Office at the time of each stration permitting payment of one-half of the total tuition and fees cept for fees payable in advance) at the time of registration and the aining half on or before October 26, 1977 (for the fall semester), and rch 8, 1978 (for the spring semester). Interest at the rate of 8 per cent annum on the unpaid balance will be charged from the date of registrato the date payment is made.

tudents receiving tuition assistance in the form of scholarships, governnt tuition contracts, or other forms of tuition awards are not permitted ign deferred payment contracts unless the total tuition and fee charges

exceed the value of the tuition awards by $650 or more. Under such cumstances the student may be permitted to pay one-half of the am due at the time of registration and to defer the balance by signi deferred payment contract.

Students who fail to make any payment when due will be automati charged a $15 late-payment fee and will be subject to the interest ch of 8 per cent per annum. Accounts which become 30 days past due w financially encumbered. In the event a student's account is financ encumbered, the student forfeits rights to the use of deferred pay contracts in future semesters, and the Student Accounts Office will n the Registrar to withhold grades, future registration privileges, transc diplomas and other academic information until the account is se financially. Financial settlement will require payment in full of all amo due to the University in addition to a financial reinstatement fee of $

Students auditing courses are subject to all fees charged to stud registered for credit.

Prepaid and Deferred Payment Plans

Several commercial programs for parents who wish to pay for colleg a monthly basis are available. Terms and conditions vary, but most pro a life insurance policy in the contract. For specific details and applicat address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Ave Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not mainta supply of applications for these various programs, but will be happ provide guidance to students and parents.

Withdrawals and Refunds*

Applications for withdrawal from the University or for change in schedule must be made in person or in writing to the dean of the col school, or division in which the student is registered. Notification t instructor is not an acceptable notice (see "Withdrawal," page 47).

In authorized withdrawals and changes in schedule, cancellation semester tuition charges and fees will be made in accordance with following schedule for the fall and spring semesters:

1. *Complete withdrawal from the University:*

FALL SEMESTER

Withdrawal dated on or before September 9, 1977.....90 per
Withdrawal dated September 12 to September 23, 1977 ....75 per
Withdrawal dated September 26 to October 7, 1977 .....50 per
Withdrawal dated after October 7, 1977 .....

* Regulations concerning withdrawal and refunds for the summer sessions are stated *Summer Sessions Schedule*.

G SEMESTER

Withdrawal dated on or before January 20, 1978 .....90 per cent
Withdrawal dated January 23 to February 3, 1978 .....75 per cent
Withdrawal dated February 6 to February 17, 1978 .....50 per cent
Withdrawal dated after February 17, 1978 .....none

r a change in status from full-time to part-time student or for partial thdrawal by a part-time student, the above schedule applies to the fference in charges between the original program and the adjusted ogram continuing in effect.

student enrolled in an undergraduate full-time program who drops adds a course and continues to be in a full-time program will have no ancial adjustments of tuition made other than those involving course es.

student who is granted military leave before completing the semester ll receive credits for current charges in accordance with the schedule r complete withdrawal from the University (see No. 1 above). Pay- ents made in excess of the nonrefundable balance will be refunded the student. The nonrefundable balance will be maintained as a ferred credit for use by the student upon return to the University (see Military Leave," page 49).

egulations governing student withdrawals as they relate to resident ll and food service charges are contained in the specific lease arrange- ents.

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o case will tuition be reduced or refunded because of absence from es.

yment applies only to the semester for which a registration charge curred and will not be credited to another semester (exception: stu- s granted military leave, see page 49).

thorization to withdraw and certification for work done will not be a student who does not have a clear financial record.

udents are encouraged to provide their own cash funds until they make banking arrangements in the community.

ANCIAL AID

UNDERGRADUATE STUDENTS*

rge Washington University offers a program of financial assistance wo basic types: awards for academic achievement without reference

*Information concerning financial aid for students from foreign countries, see pages 39-40.

to financial circumstances—honor scholarships; and scholarships, g
loans, and employment based upon demonstrated financial need.

Honor Scholarships—George Washington University honor schola
of up to $1,000 for the academic year based entirely upon aca
achievement and potential without regard to financial need, are rest
to incoming freshmen and are extremely limited in number.

Need-based Aid—The University offers extensive programs of sc
ships, grants, loans, and employment based upon demonstrated nee
University participates in the National Direct Student Loan, Basic E
tional Opportunity Grant, Supplemental Educational Opportunity G
and the College Work-Study programs

Applications and supporting credentials for financial aid must be
by February 1 (entering freshmen) or March 1 (enrolled undergradua
entering transfer students) preceding the academic year of the a
for the fall semester; by November 1, for the spring semester; and
1, for the summer sessions.* A student must reapply for financia
each year.

Complete information concerning financial assistance is contain
the pamphlet "Student Financial Aid," which is available at the Offi
Student Financial Aid, George Washington University, Washington,
20052.

The following scholarships are available to students in Colun
College of Arts and Sciences, the School of Education, the School of
ernment and Business Administration, and the School of Public and I
national Affairs. The University also offers other scholarships whic
available to students in any college or school of the University.

The George Washington University Board of Trustees Scholarsh
Full- and partial-tuition scholarships, which begin in the fall semester
extend for four successive academic years, provided the holder main
a *B* average and continues to be in financial need. Candidates must
to select a curriculum leading to a bachelor's degree in any school o
University, except the College of General Studies. Students who
demonstrated outstanding ability in interscholastic speech and de
activities are eligible for the George F. Henigan Scholarships in De
which are included among these scholarships.

Other Scholarships

Achievement Rewards for College Scientists (ARCS) Foundation, Scholarship
Sherman Page Allen Memorial Scholarship Fund (1966)
Alumni Scholarships
Mary J. Anderson Scholarship (1969)
Bache and Company Scholarships
Byron Andrews Scholarship (1920)
Henry N. Brawner, Jr., Foundation Scholarship Fund (1963)
Emma K. Carr Scholarships (1932)
Maria M. Carter Scholarship (1871)
Paul E. Casassa Memorial Foundation Scholarship (1968)

* Only students who are enrolled in this University for at least eight semester hours in the immediately preceding spring semester or who have applied for financial aid for the following semester are eligible for consideration for Summer Sessions financial aid.

Omega Alumnae Scholarship (1966)
nbian Women Scholarship Funds
toria Briggs Scholarship Fund (1959)
zabeth V. Brown Scholarship Fund (1925)
ace Ross Chamberlin Scholarship Fund (1932)
llege Women's Scholarship Fund (1926)
umbian Women Members' Scholarship Fund (1961)
ine Hughes Dufour Scholarship Fund (1961)
Watson W. Eldridge, Jr., and John F. Eldridge Scholarship Fund (1964)
unders of Columbian Women Scholarship Fund (1920)
se Lees Hardy Foundation Scholarship Fund (1957)
lian Young Herron Scholarship Fund (1925)
llie Maynard Knapp Scholarship Fund (1915)
arcia B. Kraft Scholarship Fund (1966)
net McWilliams Scholarship Fund (1954)
arie-Louise Ralph Turner Scholarship Fund (1963)
Daughters of the American Revolution Scholarship (1952)
: Davis Scholarship (1869)
rict of Columbia Institute of Certified Public Accountants Scholarship Accounting (1964)
lla Constance Drane Scholarship (1957)
ert Farnham Scholarship (1871)
eral Government Accountants Association—Washington, D.C., Chapter Scholarship in Accounting
er Brigham Fisher Scholarship (1951)
ign Student Scholarships (see page 39)
rge Washington University Tennis Alumni Association Scholarship (974)
lred Green Memorial Scholarship Fund (1959)
diron Foundation of the Gridiron Club Scholarship (1975)
a Spicker Hampel Scholarship (1949)
an O. Hargrove Scholarship (1968)
a Lewis Harvey Scholarship (1921)
leton Scholarship (1950)
rge F. Henigan Scholarships in Debate (1967)
id B. and James L. Karrick, Jr., Scholarship Fund (1968)
uel and Elizabeth Kay Scholarships (1969)
os Kendall Scholarship (1869)
oe Leggette Memorial Scholarship Established by WRGW (1968)
tha's Marathon Residence Hall Scholarship
chell-Stancioff Scholarship (1967)
Morehouse Scholarship (1861)
K. Morris Education Fund Scholarships (1972)
en Marie and Thomas E. Orr Scholarships (1965)
dy Pearce Scholarship Fund (1972)
Delta Gamma Scholarships (1956)
d B. and Alma D. Pletcher Scholarship Fund (1968)
in M. Powell Scholarships (1886)
search Assistantships in Operations Research and Related Fields (see page 36)

Resident Assistantships (see page 37)
Henry Whitefield Samson Scholarship Fund (1966)
Lula M. Shepard Scholarships (1946)
Sigma Delta Chi Foundation of Washington, D.C., Scholarships
Margaret Lucille Snoddy Scholarship (1970)
David Spencer Scholarship (1918)
Mary Lowell Stone Scholarship (1893)
Charles Clinton Swisher Scholarships (1941)
U.S. Office of Education Traineeships (1964)
University Players Scholarship in Memory of L. Poe Leggette (1968)
William Walker Scholarship (1824)
Abigail Ann Brown and Henry Kirk White Scholarship Fund (1963)
John Withington Scholarship (1830)
Women's Physical Education Alumnae Association Scholarship (1964)
William G. Woodford Scholarship (1969)
Ellen Woodhull Scholarship (1919)
Zonta Club Scholarship (1950)

Grants

The following funds have been established to meet the special nee
disadvantaged students from the District of Columbia Inner-City an
Washington metropolitan area.

George Washington University's Educational Opportunity Program T
Grants (1968)
Key Club of Walt Whitman High School, Bethesda, Md., Grant (1968)
Marriott Foundation Grant (1968)

FOR GRADUATE STUDENTS*

The George Washington University program of financial assistanc
graduate students includes assistantships, fellowships, traineeships,
uate scholarships, research appointments, part-time employment, and
Application for admission to graduate study is a prerequisite for
sideration.

Application and correspondence concerning assistantships, fellow
traineeships, or graduate scholarships should be sent directly to the
of the school concerned, and addressed to George Washington Univ
Washington, D.C. 20052. Unless otherwise specified, application and
porting credentials should be submitted no later than February 1
ceding the academic year for which the award is made.

Assistantships

Research Assistantships in Operations Research and Related Fie
Available to graduates, and to undergraduates on the junior and s
levels, in any school of the University. Research assistants are exp
to work 20 hours a week conducting research in support of an estab
research program, in programming or in conducting individual resear
an approved research project. Stipends range up to $8,000, dependin

* For information concerning financial aid for students from foreign countries, see page

status of the student and the tenure of the appointment (9–12 months). her information and applications are available from Director, Institute Management Science and Engineering, School of Engineering and Ap- d Science, George Washington University, Washington, D.C. 20052.

esident Assistantships (men and women)—Available to graduate stu- ts and seniors in any field of study who are interested in working with student personnel program in University residence halls. Specific duties y with the position, but basically consist of counseling, advising student ups, and administration. Remuneration includes full tuition and a fur- ned room for the academic year. All positions are part-time, and staff mbers are required to enroll as full-time students in degree granting grams. Application should be completed before March 1. Further in- mation may be obtained from the Office of the Director of Housing.

ington County—George Washington University Cooperative Assistant- hip Program
lth Care Administration Research Assistantships
ional League of Cities George Washington University Assistantship
an Affairs Assistantship

lowships, Internships, Traineeships, Special Programs

following fellowships, internships, and traineeships are available to dents in the Graduate School of Arts and Sciences, the School of Educa- , the School of Government and Business Administration, and the hool of Public and International Affairs. The University also offers many er fellowships which are available to students in these colleges and hools.

niversity Fellowships—Available to graduate students in master's and ctoral programs in most departments of the University. Fellowships are sed on scholarship and each fellow may receive a stipend, tuition allow- ce, and course fees.

Graduate Teaching Assistantships—Available to graduate students in ster's and doctoral programs in most departments of the University. A duate teaching assistant receives financial compensation for a desig- ted unit of service to the assistant's major department of instruction.

Research Traineeships—Available under numerous sponsored programs a number of departments. Currently, the basic medical science depart- nts and the Departments of Psychology and Speech and Drama offer ch programs. Stipends vary; information is available from the depart- nts and the Office of the Dean of the Graduate School of Arts and iences.

hievement Rewards for College Scientists (ARCS) Foundation, Inc., Fellowship
bert A. Aleshire Fellowship Fund (1971)
nerican Association of Collegiate Schools of Business Fellowship
nerican Civilization Fellowships
nerican Civilization Internships (Smithsonian Institution-George Wash- ington University Cooperative Program)
nerican Iron and Steel Institute Fellowship
thur Anderson & Co. Doctoral Fellowship

dean of the school in which the degree is to be earned. Work t
teaching fellow requires excellent knowledge of English—both spo
and written.

Long-term loan funds for undergraduate and graduate foreign stud
are limited in amount and are available only to those foreign-born per
who have established resident status in the United States through
Immigration and Naturalization Service.

We suggest that students who wish to study in the United States h
available sufficient funds to cover expenses for one full year before
tempting to enter a college or university. The cost at this University
one academic year (September-May) is approximately $6,000. This estim
includes room and board, tuition, books, clothes, and incidental expen
no travel, holiday, or medical expenses are included.

LAW ENFORCEMENT EDUCATION PROGRAM

This program of grants and loans, authorized under the provisions of
Omnibus Crime Control and Safe Streets Act of 1968, is intended to h
pay the cost of educational expenses for employees of state and local cr
nal justice agencies. Studies may be full- or part-time in a wide rang
subject areas and degree goals. Applications and further information
available from the LEEP Coordinator, Graduate School of Arts
Sciences.

PRIZES

Accounting Prizes—Three prizes awarded annually by the Departmen
Accounting—one each to the undergraduate Accounting major with
highest scholastic standing, to the candidate for the degree of Maste
Business Administration with the highest scholastic standing in the
counting concentration, and to the Doctoral candidate with a field
Accounting who has the highest scholastic standing at the completio
the General Examination.

Alpha Chi Sigma Prize—Awarded annually by the Alpha Pi Chapte
the student who has attained the highest academic record in courses
chemistry. The name and year of graduation of the student is inscribed
a bronze plaque. The winner must have had at least 16 hours in chemis
including the final semester at this University.

Alpha Kappa Psi Prize—A key, awarded annually by Beta Mu Chapte
the School of Government and Business Administration undergradu
student who has completed 90 semester hours at this University and
tained the highest grade average. The name of the winner and the y

the award are engraved on a plaque in the Office of the Dean of the hool of Government and Business Administration.

American Institute of Chemists Prize—A medal awarded annually to the aduating student majoring in chemistry who excels in scholarship, in- grity, and leadership.

Department of Art Prizes—Two prizes—one for an undergraduate major- g in Art History and one for an undergraduate majoring in Fine Arts— varded annually to the most promising students, as determined by the partmental faculty.

The Walter G. Bryte, Jr., Achievement Award—Provided by Walter G. yte, Jr., Colonel, U.S. Air Force (retired), first Professor of Air Science at eorge Washington University. The award is presented annually primarily that undergraduate residence hall, secondarily to any other activity at e University, which has shown under the leadership of its elected or signated head, the most improvement or excellence in its support of the inciples and aims of the United States of America and George Wash- gton University. The hall or other activity will be awarded a cash prize, d the name of its leader and the hall or activity will be engraved on a lver trophy.

Byrne Thurtell Burns Memorial Prize—Awarded to the senior majoring in emistry who shows the greatest proficiency in organic chemistry, as evi- enced by a comprehensive examination, and who possesses such qualifica- ons of mind, character, and personality as to give promise of future chievement.

Business Administration Prize—Awarded annually by the Department of usiness Administration to the outstanding graduating senior in business dministration on the basis of scholarship, leadership and service to the niversity.

Wilbur J. Carr Prize—Established in 1962 by Edith K. Carr, former Trus- ee of the University, in memory of her distinguished husband, who was raduated from the School of Comparative Jurisprudence and Diplomacy 1899. It is awarded annually to that student in the graduating class of e University who has demonstrated outstanding ability in the study of ternational affairs and who has given evidence of possessing in marked egree the qualities which produce the good citizen and the dedicated ublic servant.

The Chemical Rubber Co. Freshman Chemistry Achievement Prize—A *landbook of Chemistry and Physics* awarded annually to the freshman tudent who has demonstrated the greatest achievement in Chemistry 5-16.

John Henry Cowles Prizes—Two prizes, established by John H. Cowles, rand Commander of the Supreme Council of Thirty-third Degree (Mother ouncil of the World) of the Ancient and Accepted Scottish Rite of Free- asonry, Southern Jurisdiction of the United States of America. Awarded nnually to the senior in the School of Government and Business Ad- inistration and to the senior in the School of Public and International ffairs with the highest academic averages.

DeWitt Clinton Croissant Prize—Awarded annually to the undergraduate tudent enrolled in a course in drama or active in University dramatics who ubmits to the English Department the best essay on drama or the theater.

E.K. Cutter Prize—Established by Marion Kendall Cutter "for excell in the study of English." Awarded to the member of the graduating c whose record in English, combined with general excellence, shows r marked aptitude for and attainment in English studies.

Isaac Davis Prizes—Established in 1847 and awarded annually to three seniors who have made the greatest progress in public speaking w enrolled in the University. Awards are to be determined by a pul speaking contest in which the participants deliver original orations. C members of the senior class of Columbian College of Arts and Scien who are candidates for the degree of Bachelor of Arts or Bachelor Science are eligible to compete.

Henry Grattan Doyle Memorial Prize—Established in memory of He Grattan Doyle, a former Dean of Columbian College. Awarded annuall an outstanding senior for excellence in Spanish.

Elton Prize—Established by the Reverend Romeo Elton, of Exeter, E land, and awarded annually to the student with the highest average in most advanced course in the Greek language and literature.

Jesse Frederick Essary Prize in Journalism—Established by Helen Ess Murphy and awarded annually to a student who has given promise sound citizenship and who submits the best printed and published evide of ability in "forthright reporting" and good journalistic writing, in a s dent publication or elsewhere.

Willie E. Fitch Prize—Established by James E. Fitch in memory of son. Awarded annually to a senior student for the best examination chemistry.

Alice Douglas Goddard Prize—A memorial established by Freder Joseph Goddard, of Georgetown, D.C. Awarded annually to the sen student making the highest average in American literature.

Edward Carrington Goddard Prize—Established by Mary William Goddard, Alice Douglas Goddard, and Frederick Joseph Goddard, Georgetown, D.C., in memory of Edward Carrington Goddard, class 1881. Awarded to the junior or senior student making the highest aver in the French language and literature.

Morgan Richardson Goddard Prize—A memorial established by M Williamson Goddard, Alice Douglas Goddard, and Frederick Joseph G dard, of Georgetown, D.C. Awarded to the junior or senior student mak the highest average in the following fields: business administration, e nomics, international business, or public accounting.

Government Employees Insurance Company and Affiliates Achievem Awards—A $200 cash award is given in each of the following five are Health Care Administration, Management Science, Public Administrati Business Statistics, and Urban and Regional Planning.

Gardiner G. Hubbard Memorial Prize in United States History—Est lished by Gertrude M. Hubbard in memory of her husband and award annually to that member of the graduating class majoring in history w has maintained the highest standing in courses in United States history

International Business Prize—Two prizes awarded annually by School of Government and Business Administration to students specia ing in international business, one awarded to a graduating senior and o awarded to a graduate student.

Kappa Kappa Gamma Prize—Awarded annually to a full-time freshman sophomore student for excellence in Biological Sciences 12.

David Lloyd Kreeger Prizes in Art—Five prizes given by Mr. Kreeger, ee in the fine arts and two in art history (including museology). Fine s prizes are awarded to a senior or graduate student in painting, sculp-e, and graphics or design. One prize in art history is awarded to a ior and one to a graduate student. Candidates for the prizes must sub-original papers or works of art. Winners are selected by distinguished presentatives of the field of art in the Washington, D.C., area.

Minna Mirin Kullback Memorial Prize—Established in 1968 by Solomon llback in memory of his wife. Awarded annually by a committee of culty members of the Department of Statistics to a full-time under-duate or graduate student majoring in statistics, who will have com-ted 18 semester hours of statistics courses by the end of the spring mester.

John Francis Latimer Prize in Classics—Established in 1973. Awarded a graduating senior who has made the most outstanding record as a jor in the Department of Classics.

Vivian Nellis Memorial Prize—Awarded to a student in the English De-rtment who has shown special promise in the field of creative writing.

Phi Delta Kappa Prize—Awarded annually by Beta Gamma Chapter to outstanding senior in the teacher education program in the School of ducation.

Phi Eta Sigma Prize—A choice book selected from the field of the re-pient's major, awarded annually by the George Washington University apter to the student attaining the highest scholastic average in the first ll semester of work. The winner's name is engraved on a plaque in the ffice of the Dean of Columbian College of Arts and Sciences.

Pi Lambda Theta Prize—Awarded annually by Alpha Theta Chapter to n outstanding senior in the teacher education program in the School of ducation.

Psi Chi Prizes—Two prizes awarded annually by the George Washington niversity Chapter to the best undergraduate student in experimental psy-hology and to the M.A. degree candidate or second-year graduate student ubmitting the best thesis or research project in psychology.

Ruggles Prize—Established by Professor William Ruggles in 1859, warded annually to a candidate for a bachelor's degree for excellence in athematics.

Hermann and Johanna Richter Schoenfeld Prize—Established in grateful ppreciation of the inspired teaching and devotion to his students of Dr. ermann Schoenfeld, who for more than 20 years until his death in 1926 eaded the Department of German. Hermann Schoenfeld, Ph.D., LL.D., as widely recognized as a scholar of distinction whose presence on the aculty added prestige to the University. This prize is given annually to a nember of the graduating class for excellence in historical and cultural hases of German studies.

Society of Colonial Wars in the District of Columbia Prize—A gold nedal awarded to a candidate for a graduate degree who, in the judgment f the faculty of the Department of History, submits a thesis or disserta-ion demonstrating excellence in historical research in American Colonial

history. The University reserves the right to withhold the award if thesis or dissertation attaining the required degree of excellence is s mitted.

Staughton Prize—Established by the Reverend Romeo Elton and award annually to the student making the best record in the most advan courses in the Latin language and literature.

James MacBride Sterrett, Jr., Prize—Established in 1911 by Profes Sterrett in memory of his son. Awarded annually to the student who tains the highest average in Physics 1 and 2.

Charles Clinton Swisher Historical Club Prize—Established in 1936 the Charles Clinton Swisher Historical Club and augmented in 1941 by bequest of Professor Swisher. Awarded annually to the student who s mits the best essay covering some phase of medieval history.

James H. Taylor Graduate Mathematics Prize—Established in memory James H. Taylor, former Professor of Mathematics at the Universi Awarded annually to a graduate student for outstanding performance mathematics.

Benjamin D. Van Evera Memorial Prize—Awarded annually to t Graduate Teaching Fellow in Chemistry selected as the most effect teacher during the current academic year.

The Wall Street Journal Leadership Prize—Awarded annually to a gra ating senior in the Bachelor of Business Administration degree progr for outstanding leadership and service to the University.

Thomas F. Walsh Prize—Established in 1901 and awarded annually the student who submits the best essay in Irish history.

The Washington Society of Investment Analysts Award—A $500 aw given to a full-time candidate for the Master of Business Administrat degree who is interested in finance and investments, has a high und graduate academic record, and demonstrates financial need.

Alexander Wilbourne Weddell Prize—Established in 1923 by Virgi Chase Weddell in memory of her husband. Awarded annually to a deg candidate who writes the best essay on "the promotion of peace am the nations of the world." The prize essays shall become the property the University and shall not be printed or published without the writt consent of the University. The University reserves the right to withh the award if no essay attaining the required degree of excellence submitted.

REGULATIONS

Students enrolled in the University are required to conform to the follo ing regulations and to comply with the rules and regulations of the colle school, or division in which registered.

tudents who withdraw or are suspended, or are otherwise absent n the University for one semester or more, may re-enter and continue rk only under the regulations and requirements in force at the time eturn.

a student knowingly makes a false statement or conceals material rmation on an application for admission, registration card or any other versity document, the student's registration may be cancelled. If such ification is discovered after the student has established an academic ord at the University, the student may be subject to dismissal from University. Such a student will be ineligible (except by special action he Faculty) for subsequent registration in the University.

TENDANCE

dents may not attend classes until registration is completed and fees are paid. They may attend only those classes for which they are istered. Regular attendance is expected. Students may be dropped from course for undue absence.

HOLARSHIP REQUIREMENTS

dents who fail to maintain the scholarship requirements of the college, ool, or division in which registered may be dismissed from the Uni- sity.

ades

ades are mailed to students through the Office of the Registrar at the se of each semester. They are not given out by instructors.

DERGRADUATE

e following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfac- y; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; *CR*, edit; *NC*, No Credit. Except for courses which specifically state that petition for credit is permitted, a candidate for a degree at this Univer- y may not repeat for credit a course in which a grade of *D* or better was ceived, unless required to do so by the department concerned. A written tement to this effect must be submitted to the Registrar by the ap- opriate department chairman.

RADUATE

he following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum ss; *F*, Fail; *I*, Incomplete; *CR*, Credit; *W*, Authorized Withdrawal. Except r courses which specifically state that repetition for credit is permitted, a ndidate for a degree at this University may not repeat for credit a course which a grade of C or above was received, unless required to do so by

the department concerned. A written statement to this effect mus submitted to the Registrar by the appropriate departmental chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Whenever a grade has not been assigned, the symbol *I* (Incomplete), symbol *W* (Authorized Withdrawal) or the symbol *F* (Unauthorized W drawal) will be recorded. The symbol *I* indicates that a satisfactory planation has been given the instructor for the student's inability complete the required work of the course. At the option of the instru the grade of *I* may be recorded if a student, for reasons beyond the dent's control, is unable to complete the work of the course, and if instructor is informed of, and approves, such reasons before the date w grades must be reported. The grade may be used only if the student's performance and class attendance in the course have been satisfact Any failure to complete the work of a course which is not satisfact explained to the instructor before the date when grades must be turne will be graded *F*. If acceptable reasons are later presented to the inst tor, that instructor may initiate an appropriate grade change.

REMOVING AN INCOMPLETE

For information concerning the removal of a grade of Incomplete fro student's record, consult the regulations of the college, school, or divi concerned.

THE QUALITY-POINT INDEX*

Scholarship is computed in terms of the quality-point index, obtained dividing the number of quality points by the number of semeste. ho for which the student has registered, both based on his or her record in University. Quality points are computed from grades as follows: *A*, points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for semester hour for which the student has registered. Courses marked *I*, *NC*, or *CR* are not considered in determining the index, except courses marked *I* will be considered when a formal grade is recor Grades in courses taken at another institution are not considered in c puting the quality-point index.

Final Examinations

Final examinations for undergraduate courses are scheduled by the O of the Registrar. Examinations for courses numbered 201 or above scheduled, if desired, by the individual department or instructor.

Academic Dishonesty

The University community, in order to fulfill its purposes, must estab and maintain guidelines of academic behavior. All members of the c

* Applicable only to the Graduate School of Arts and Sciences, the School of Education, School of Government and Business Administration, and the graduate programs in the Sc of Public and International Affairs.

unity are expected to exhibit honesty and competence in their academic ork. Incoming students have a special responsibility to acquaint themelves with, and make use of, all proper procedures for doing research, riting papers, and taking examinations.

Members of the community will be presumed to be familiar with the roper academic procedures and held responsible for applying them. eliberate failure to act in accordance with such procedures will be onsidered academic dishonesty. Acts of academic dishonesty are a legal, oral, and intellectual offense against the community and will be prosecuted through the proper university channels.

Copies of the University policy on academic dishonesty can be obained from the following officers: all department chairmen, all academic eans, and the Vice President for Academic Affairs.

TUDENT CONDUCT

ll students upon enrolling and while attending The George Washington niversity are subject to the provisions of the *Statement of Student ights and Responsibilities* which outlines student freedoms and responsiilities of conduct, the Judicial System for Non-Academic Student Disipline, and other policies and regulations as adopted and promulgated by ppropriate University authorities. Copies of these documents may be btained at the Office of the Vice President for Student Affairs. Sanctions or violation of these regulations may include permanent expulsion from he University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular prorram, facility or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

WITHDRAWAL

Withdrawal from a course or from the University requires the permission of the dean of the college, school, or division in which the student is registered. Permission to withdraw from the University will not be granted a student who does not have a clear financial record (see "Payment of Fees").

Each college, school, and division of the University sets deadline dates for each semester concerning withdrawal. Withdrawal between these dates and the end of the semester is permitted only in exceptional circumstances.

All charges for courses dropped without the approval of the dean must be met by the student.

CHANGES IN PROGRAM OF STUDY

Changes within a College, School, or Division—A student may not substitute one course for another, drop courses (see "Withdrawal" above),

change status from credit to audit or from audit to credit without the a
proval of the dean of the college, school, or division in which registered
Change from one section to another of the same course may be ma
with the approval of the dean and the department concerned.

Change from one major field to another within the same college
school may be made with the approval of the dean.

Transfer within the University—Application for transfer to another c
lege, school, or division must be made to the appropriate admitting offi
on the form provided by the deans concerned. Transfer from the appr
priate preprofessional curriculum in Columbian College to bachelor's d
gree candidacy in the School of Public and International Affairs may ta
place upon the completion of 60 or more semester hours of course wo
and of the necessary procedures required by the particular school.

With the exception of the School of Government and Business Admi
stration which limits a student to 15 semester hours earned in no
matriculated status, a maximum of 45 semester hours earned in t
Division of University Students may be applied toward a bachelo
degree in the other degree-granting colleges or schools of the Universit
Work done in the Division of University Students will not be count
toward a graduate degree unless prior written approval, obtained fro
the relevant degree-granting college or school, has been filed in th
Office of the Dean of the Division of University Students (see page 17

Students transferring within the University are advised to study car
fully the requirements listed below under the heading "Graduation R
quirements," and to note that, unless otherwise specified, in all unde
graduate divisions, 30 semester hours, including at least 12 semester hou
in the major field, must be completed while registered in the school
college from which the degree is sought. Upon transfer the student shoul
consult the dean concerned and understand clearly the requiremen
which must be fulfilled.

CREDIT

Credit is given only after registration for a course and satisfactory compl
tion of the required work, or upon the assignment of advanced standin
in accordance with the regulations of the several colleges, schools, an
divisions.

Auditing—A person who has been admitted to the University may b
registered, with the permission of the instructor, as an auditor in a cla
(no academic credit). An auditor is not required to take active part or
pass examinations. A student who takes a course as an auditor may n
repeat it later for credit.

POST-ADMISSION TRANSFER CREDIT

Students who plan to attend another institution and apply credit so earne
toward graduation from this University, must first secure the written ap
proval of their dean. In no event will credit in excess of what might b
earned in a similar period in this University be recognized.

ALANCE SHEET

request, the Office of the Registrar will issue to undergraduate degree ndidates a balance sheet showing the amount of work completed and the quirements remaining to be met for the degree. A second balance sheet issued only if the student changes major or degree objectives.

ANSCRIPTS OF RECORD

ficial transcripts of student records are issued on written request of the dent or former student who has a clear financial record. A fee of $2 charged for each transcript. When more than two transcripts are ordered the same time, a $2 fee is charged for each of the first two transcripts d a $.50 fee is charged for each additional transcript.

ONTINUOUS REGISTRATION

egree candidates are expected to maintain continuous registration until l degree requirements are satisfied. Students who have completed their ourse requirements (including the thesis) must maintain continuous regis- ation by paying the "continuous registration" fee (see page 30). By failing register for one semester or more, the student breaks registration and ust be readmitted (see "Readmission," page 25). A readmitted student subject to the regulations and requirements in force at the time of eadmission.

Students must be registered during the summer if they are taking ourses, are taking required examinations, are receiving guidance on theses r dissertations, or are expecting to be graduated at the end of the ummer Sessions.

ILITARY LEAVE

A student called to active duty may be granted military leave for the eriod of active duty, upon presentation to the dean of a copy of the nilitary orders and a petition for such leave. The maintenance of "continu- ous registration" is not required of the student on military leave; however, he student must apply for readmission to the University well in advance of the semester of expected return. Payments for tuition and fees which are not refunded to the student at the time military leave is granted will be maintained as a deferred credit for the student's account and used upon return to the University.

RADUATION REQUIREMENTS

Degrees are conferred in February, May, and September.

To be recommended by the Faculty for graduation a student must have met the admission requirements of the college or school in which regis-

tered; completed satisfactorily the scholarship, curriculum, residence a other requirements for the degree for which registered; and be free fr all indebtedness to the University. Registration, either for course wo or on the "continuous registration" fee basis, is required for the semes or summer session at the close of which the degree is to be conferred

Application for Graduation—An "Application for Graduation" fo must be filed and the appropriate fee paid at the time of registration the last semester or summer session of the senior or final year. Stude completing degree requirements during the Summer Sessions will awarded diplomas (no formal convocation) dated September 30, provid they have completed all degree requirements and have applied for gradu tion as a part of registration for the Summer Sessions.

Scholarship—The student must meet the scholarship requirements the particular degree for which registered.

Curriculum—Minimum curriculum requirements for each degree stated under the college or school offering work in preparation for t degree.

Residence—Unless otherwise specified, in all undergraduate divisio of the University, a minimum of 30 semester hours, including at least hours in the major field, must be completed while registered in the scho or college from which the degree is sought. This requirement applies students transferring within the University as well as to students tra ferring from other institutions. Unless special permission is granted the dean of the college or school concerned to pursue work elsewhe the work of the senior or final year must be completed in the college school from which the degree is sought.

The graduate student must meet the residence requirements for t particular degree for which registered.

National Teacher Examinations—All candidates for the degree of Bach lor of Arts in Education are required to take the National Teach Examinations.

Attendance and Conduct—The University reserves the right to refu to confer a degree upon a candidate whose attendance or conduct has be unsatisfactory.

Thesis or Dissertation—A thesis or dissertation submitted in part fulfillment of requirements for a degree must be presented in its fin form to the dean of the college or school concerned no later than the da specified in the University Calendar.

Accepted theses and dissertations, with accompanying drawings, b come the property of the University and are deposited in the Universi Library, where the duplicate copies are bound and made available f circulation. See the appropriate college or school in this catalogue f regulations governing theses and dissertations.

HONORS

WITH DISTINCTION

In all undergraduate divisions of the University a baccalaureate degr may be conferred "With Distinction," at the discretion of the faculty, if

dent meets the specific requirements of the student's college or school follows:

1. Columbian College of Arts and Sciences or School of Public and ternational Affairs—the attainment of the grades of *A* in 60 per cent of e courses taken at GW; or

2. School of Education or School of Government and Business Admin- ration—the attainment of a quality-point index of 3.50 or higher in all urse work taken at GW.

To be eligible a student must have completed at this institution at least e-half of the courses required for the degree.

PECIAL HONORS

pecial Honors may be awarded by the faculty to any member of the raduating class for outstanding achievement in the student's major field n recommendation of the major department. The student must fulfill all f the following requirements:

1. Candidacy for Special Honors must be approved by the faculty mem- er representing the major department or field not later than the beginning f the senior year.

2. Such other conditions as may be set at the time the candidacy is pproved must be met.

3. At least one-half of the courses required for the degree must have een completed at GW.

4. The specific requirement of the college or school in which registered ust be fulfilled, as follows: (a) Columbian College of Arts and Sciences r the School of Public and International Affairs—attainment of the rades of *A* or *B* in 50 per cent of the courses taken at this institution; or b) the School of Education or the School of Government and Business dministration—maintain a quality-point index of at least 3.0 on all course ork taken at GW.

EPARTMENTAL HONORS

he Department of History offers Departmental Honors if students meet pecific requirements. For details, see the Department of History, page 33.

HE LIBRARY

ll students registered in the University have the privilege of using the niversity Library. Its stacks are open, and all students are welcome to rowse. A card denoting approved enrollment for the current semester ust be presented when books are borrowed for outside use.

The loan period for stack books is 14 days. Any book which circulates s subject to recall by the library if needed for reserve or other use. Re- erve books must be used in the reserve reading room when the library s open, except that they may be withdrawn for overnight use beginning t 8:30 p.m. Grades are withheld until a student's library record is clear, ith all borrowed books returned and any fines paid.

All students using the University Library are expected to be fa
with its detailed regulations, available at any of the library's service

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any st
from the University, or from any class or classes, whenever, in the int
of the student or the University, the University Administration dee
advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools and divisions reserve
right to modify or change requirements, rules and fees. Such regulat
shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs w
out notice whenever circumstances warrant such changes.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to insti
tional policies governing access to and release of student education r
ords maintained by educational institutions which are recipients of fede
funds. The University complies with this statute, which states, in pa
that such institutions must:

1. afford students access to education records directly related to the
2. offer students an opportunity for a hearing to challenge such recor
as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information fro
their education records to persons outside the University, except f
directory information as indicated below. Information may be fu
nished to a student's parents without such written consent only upo
certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to relea
a student's record, notifying the student of this action.

The University will release the following directory information upo
request: address; telephone number; dates of attendance; school, colle
or division of enrollment; field of study; credit hours earned; degree
earned; and honors received. A student who does not wish such directo
information released must file written notice to this effect in the Offic
of the Registrar.

University guidelines on the release of student information may be obtained from the Office of the Registrar.

ROPERTY RESPONSIBILITY

he University is not responsible for the loss of personal property. A Lost nd Found Office is maintained on campus in the Safety and Security ffice.

NIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation of hose laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative ction, which may include dismissal from the residence halls, revocation f other privileges, or suspension or dismissal from the University, may e taken in order to protect the interests of the University and the rights f others.

ASSOCIATIONS AND SERVICES

CONSORTIUM OF UNIVERSITIES OF THE WASHINGTON METROPOLITAN AREA, INC.

The universities in Washington, D.C.—American University, Catholic University of America, George Washington University, Georgetown University and Howard University—are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all the particular courses which best meet their needs.

Participation is limited to campus degree candidates. The following, however, are excluded: students in canon law, dentistry, medicine, and theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (such as music or art)

CONTINUING EDUCATION FOR WOMEN

Continuing Education for Women Center, Suite 621-24, University Lib
offers individual and group counseling services as well as credit and
credit courses and career training programs. Brochures are available.

GENERAL ALUMNI ASSOCIATION

The objectives of this association are to unite the graduates who wis
associate themselves for charitable, educational, literary and scien
purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of
University and who have left the University in good standing, or
person who is or has been a member of the teaching, research or admi
trative staff of the University, or of the Board of Trustees of the U
versity. Active members are those who are life members of the Geo
Washington University General Alumni Association or the Alumni
sociation of any school of the University, or are current contributors
the George Washington University Fund.

All alumni are urged to keep the Alumni Office informed of chan
of address or occupation and to supply information with regard to th
fellow alumni. The Office is located in Alumni House, 714 21st St., N.
George Washington University, Washington, D.C. 20052.

ENGLISH FOR INTERNATIONAL STUDENTS

Director G.R. Bozzini

This is a comprehensive program in English as a foreign language, d
signed to serve members of Washington's international community wis
ing either to enroll in University credit programs or to improve their co
mand of English through a semi-intensive study program. In gener
students must have completed the equivalent of a United States hi
school education.

Courses are offered at various levels of proficiency covering both o
and written communication and are scheduled in 14-week sessions duri
the fall and spring semesters and for eight weeks during the summ
Students entering the program will take a battery of tests to determi
their levels of proficiency for placement in English and academic pr
grams. Registration for the tests is held in advance at the Office of Engli
for International Students, Park Lane Building, Suite 317, 2025 Eye S
N.W., Washington, D.C. 20052. A $10 testing fee, payable in advance,
charged each student.

Persons writing from outside the United States and needing a stude
visa will be considered for I-20 (certificate of eligibility for student vis
validation only if they apply for admission to a degree program. Tho
interested in applying for a degree program should see pages 25–27 f
additional information.

TUDENT LIFE

ice President for Student Affairs William Smith, Jr.
ssistant to the Vice President for Student Affairs John Perkins

he Office of the Vice President for Student Affairs develops student life ervices, policies and procedures to complement the University's formal nstruction program. These activities are implemented through the offices f the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, ducational Opportunity Program, Housing, International Students, Stuent Activities, Student and Alumni Career Services, and Student Health ervice.

FFICE OF THE DEAN OF STUDENTS

ean of Students Gail Short Hanson
ssistant Dean of Students Cheryl Beil

he Office of the Dean of Students provides counseling and information or students, and assists in program development on campus, particularly n the residence halls. Staff members are well-informed on University olicies and the various student services provided on campus, enabling hem to provide referrals and answers to many questions concerning genral student life. Personal letters of recommendation for students applying o graduate and professional schools can be obtained from this office. The ean of Students works with the Advisor to International Students, the irector of the Counseling Center, the Director of the Educational Opportunity Program, the Director of the Student Health Service, and the Director of the Student and Alumni Career Services Office in the implementation of their programs.

Counseling Center

Director E. Lakin Phillips
Assistant Director David Celio

The Counseling Center works to enable students to overcome obstacles which hamper learning. The Center's services are offered to students and staff, and include (1) resolution of the individual's educational, vocational, or personal conflicts through short-term individual or group counseling, vocational testing, or study skills remediation; (2) training of graduate students, resident assistants and paraprofessionals; (3) consulting on mental health topics; and (4) development of new methods and programs to aid student growth, such as counseling through written communication, videotaped counselor skills training, and interpersonal skills workshops.

The Center administers the Miller Analogies Test, admissions testing,

and special assessments for business and industry. Through its Office Community Services, the Counseling Center also provides vocational co seling and educational programs to the greater Washington community

Students may request a cost-free interview from 9 a.m. to 4:30 p. Monday through Thursday, and 1-4:30 p.m. on Fridays. If the student cides to continue the services offered, a fee of $5 per appointment will charged for short-term treatment. If a test battery is called for, an ad tional $12 materials fee will be charged. However, if financial need is factor, fee adjustments can be made.

The Counseling Center is located at 718 21st St., N.W.

International House

Advisor to International Students Patricia McMillen

Located in the International House at 2129 G St., N.W., the Advisor International Students provides advising and counseling in matters personal and academic concern and visa regulations. This office is al a consultation, information and resource center for the University's i ternational population.

The International Student Society, which seeks to promote internation friendship and understanding, is also located in International House. Th organization welcomes as members students from all countries, includi the United States.

Educational Opportunity Program

Director Ronald Whitmore
Counselor Marquita Green

The Educational Opportunity Program is designed to offer a college ed cation to graduates of District of Columbia high schools and other qual fied District residents. The Program provides its students with academ and financial aid as they pursue degree work in the fields of their choic

Student and Alumni Career Services Office

Director Gordon Gray
Assistant Director Cynthia Gurne
Counselor Paula Hoffman

The Career Services Office provides career guidance and placement to GW students and alumni. Some of the specific services are: full-time and par time job vacancy lists, career counseling, programs on job-seeking skill a full library of literature on occupations and employers, and current in formation on government employment including testing dates and applic tion forms. Seniors and alumni may also use the office to establish cre dential files for application to graduate schools and for employment. Th office is open from 9 a.m. to 5 p.m. Monday through Friday, with evenin hours scheduled during each semester. It is located at Woodhull House 2033 G St., N.W.

ident Health Service

rector Naomi Schaub, M.D.

e Student Health Service is an outpatient clinic located in the H. B. rns Memorial Building at 935 22nd St., N.W.

Physicians and physician assistants are available by appointment from a.m. to 4:45 p.m., Monday through Friday. In addition, physician as- tants are available for primary care to walk-in patients Monday through iday from 5 to 6:45 p.m., on Saturday from 9 a.m. to noon, and on Sun- y from 10 a.m. to noon.

For serious emergencies occurring during hours when the Student ealth Service is closed, students may go to the Emergency Room of the niversity Hospital for treatment. This arrangement is for emergency re only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to ceive treatment at the Student Health Service. Students who so desire ay engage physicians and nurses of their own choice, but these students ill be responsible for all fees charged. The bills incurred from all services ndered outside of the Student Health Service (for example, x-ray work, boratory work, and referrals to specialists or other outside physicians) e the responsibility of the student.

EALTH AND ACCIDENT INSURANCE

ne Student Health Service has arranged for and endorsed group health id accident insurance, on an elective basis, for those students who do ot have other coverage. Interested students should contact the Student ealth Service office.

OUSING

irector of Housing Ann Webster
ssistant Directors of Housing John Bohen, Marilyn Mundy, Clay Nelson

omplete information concerning the University's residence halls is avail- ble from the Director of Housing, George Washington University, Wash- gton, D.C. 20052. Information concerning off-campus housing near the niversity also may be obtained at this Office.

Admission to the University does not include a room reservation. The tudent will receive, with the notification of acceptance, University resi- ence hall information, an application for residence hall space, and a eclaration of intent to attend the University. The application for resi- ence hall space must be accompanied by a $100 *nonrefundable deposit*. he housing deposit is credited toward the first semester's room charge. ooms are leased for the academic year, and lease payment must be ade by June 30 for the fall semester.

1977-78 Residence Hall Rates Per Person for Two Semesters*

For Men:

Calhoun Hall
- double room $1
- triple room 1

For Women:

Strong Hall
- single room 1
- double room 1
- triple room 1

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors) double room 1

Francis Scott Key Hall (limited to juniors and seniors):
- apartment for two persons 1
- apartment for three persons .....1,200 or 1

Mitchell Hall (limited to sophomores, juniors, and seniors) single room 1

Madison Hall
- double room 1
- triple room 1

Thurston Hall
- double room, triple room, large room for four 1
- suite for six 1

Food Service

Resident freshmen and sophomores are required to participate in the fo service plan. Freshmen must participate in the seven-day, 20 meals p week plan, at the rate of $820* for the academic year. Sophomores m elect either the 20-meal plan or a five-day meal plan, 15 meals Mond through Friday, for $760* for the academic year. Each plan, plus an ad tional "any 10 meals" per week plan at $640* for the academic year, optional for junior, senior, and graduate students. Food service payme does not cover University intersession or vacation periods. All meal car admit bearer to dining rooms in Thurston and Mitchell Halls and t second floor contract dining room in the Cloyd Heck Marvin Center.

Students who observe the Jewish dietary laws can write to make a rangements with the George Washington University Housing Office r garding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Munson Hall Apartments

Munson Hall is a University owned and operated apartment house co taining 15 one-bedroom and 54 efficiency apartments. Graduate and ma ried students are eligible to reside in Munson Hall. Those wishing to app for an apartment should contact the Housing Office for a waiting li application. All leases are for 12 months.

* Residence hall prices and allocation and food service prices subject to change.

'D HECK MARVIN CENTER

tor Boris Bell
tant Director Donald Cotter

Cloyd Heck Marvin Center serves as the campus community center, ding services, conveniences, and recreational and social opportunities udents, faculty, staff, alumni, and guests. Its wide range of facilities des the setting for a variety of programs conducted by the University am Board; by the departments of drama, dance, and music; and by student and faculty organizations.

e Center Governing Board, representative of all segments of the Uni- y community, plays an important role in the day-to-day functioning e Center. This Board works closely with the full-time staff in the opment of procedures and policies which provide a framework for enter's operation.

DENT ACTIVITIES OFFICE

tor of Student Activities Leila Lesko
tant Director—Orientation Rita Goldman
tant Director—Programming Claudia Derricotte

Student Activities Office assists individual students and organizations ogram development, campus leadership training, and participation in al projects, both within the University community and the com- ty at large. The Office serves as a clearinghouse for activities infor- n, registers and advises student organizations, and informs the Uni- ty community of activities and programs through a variety of weekly, hly and annual publications. The Student Activities Office is also nsible for coordinating the orientation program for new students. nts who want to participate in the extracurricular phases of Uni- ty life should acquaint themselves with the facilities and staff of the nt Activities Office.

VERSITY COMMITTEES AND ORGANIZATIONS

nt involvement is a motivating force in the governance of the Uni- ty through the committee structure. This involvement has helped lop policies and programs beneficial to the student population and to otal University community. The numerous committees on which stu- s may serve are described in the *Student Handbook*, which is available e Student Activities Office.

ent Government

George Washington University Student Association (GWUSA) is prised of all full-time and part-time graduate, professional, and under- uate students who are registered for academic credit on campus. A of elected and appointed individuals is responsible for representing

the interests of students at the University. Students who have co at least 12 semester hours and are in good academic standing are to participate in student government. Further information can tained from the Student Activities Office.

Student Organizations

Students are encouraged to become involved with existing stud ganizations or to initiate their own. The *Student Handbook*, avail the Student Activities Office, lists approximately 150 organizations the following categories: Academic; Professional; Honorary; Interna Cultural; Political Interest; Service; Special Interest; Sports, Hobbi Recreation; Religious and Meditative; and Social Fraternities and ties. More complete information about these organizations can be o through the Student Activities Office.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to of its students and encourages them to participate in the various re organizations of their own choice. Catholic, Jewish, and Protestant sponsor various groups and form a link between the University a religious community. The advisers of the religious organizations are able for counseling.

Religious services in various traditions are provided regularly University community as announced.

MAJOR PROGRAM EVENTS

Art Exhibits—The work of locally, nationally, and internationally artists is shown in monthly exhibits in the Dimock Gallery in Lisner torium and in the art gallery of the Cloyd Heck Marvin Center. Wi cooperation of the Curator of Art, an annual student art exhibit sented.

Concert Series—The Department of Music presents a series of co featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, in studio performances, experimental events, television appearance lecture-demonstrations. Students may audition to become company bers and have the opportunity to choreograph, perform, and gain ence in the technical aspects of dance productions.

International Programs—The International Student Society prese annual International Dinner in cooperation with foreign embassie international restaurants. Other programs include regular forum speakers on international topics.

Orchestra and Chorus Concert Series—The University Orchestr Chorus are two facets of the lively arts available to students eith credit courses or as extracurricular activities. The Chorus presents performances to the University community three or four times a ye

g regular winter and spring concerts. The University Orchestra pre-
several performances annually.
gram Board Series—In addition to weekly films and special events,
niversity Program Board regularly sponsors concerts and lectures.
reation Program—The new Charles E. Smith Center for Physical
tion and Athletics offers many facilities for student use. The Univer-
ecreation Association and the Department of Human Kinetics and
e Studies arrange a wide variety of sports and recreational activities
pecial events for all students.
ater—The University Theater produces four or five major plays and
als during the year on the proscenium/thrust stage in the Dorothy
Marvin Theatre or in Lisner Auditorium. Additional works, including
al and experimental plays, are produced in a more intimate studio
r. Students have the opportunity to participate in all aspects of
r and may receive credit toward their B.A. or M.F.A. degrees for
of their production work.

ETICS AND INTRAMURAL SPORTS

Jniversity is a member of the National Collegiate Athletic Associa-
he Eastern College Athletic Conference, the Association for Inter-
iate Athletics for Women and the Eastern Association of Inter-
iate Athletics for Women. Its teams participate against major
rsities throughout the Midwest and Eastern Seaboard. The intercol-
e programs for men and women offer such sports as basketball,
all, soccer, tennis, golf, wrestling, crew, cross country, swimming
iving, squash, badminton and volleyball.
University offers a broad program of intramural sports activities
oth men and women through the Department of Human Kinetics and
re Studies.

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Dean C.D. Linton
Assistant Deans B.J. Dunham, J.L. Métivier, Jr., R.C. Rutledge, H.E. Yeide, Jr.

FACULTY*

Professors E. Abravanel, J.G. Allee, Jr., J. Aschheim, R.L.A. Bari
launde-Terry *(Visiting)*, O. Bergmann, L.S. Bowling, H.F. Brigh
Brown, J.F. Burks, W.E. Caldwell, G.V. Carroll, I.H. Cisin, A.G.
J. Cornfield, T.F. Courtless, Jr., R.H. Davison, L.G. DePauw
Desmond, R.M. Dunn, Jr., J. Eisenstein, N. Filipescu, J.A. Fre
Ganz, Jr., J.L. Gastwirth M. Gordon, S.W. Greenhouse, F.S.
A. Gyorgy, R.C. Haskett, J. Helmer, P.H. Highfill, Jr., P.P. Hi
Hillis, H.C. Hinton, H.H. Hobbs, M.A. Holman, C. Hsieh, W.A.
(Research), R.G. Jones, I. Katz, J.W. Kendrick, R.W. Kenny, H.
Y. Kim, J.C. King, A.D. Kirsch, D. Krueger *(Research)*, R.M.
T.Z. Lavine, H.L. LeBlanc, L.P. Leite *(Emeritus)*, P.H.M. Lenge
S. Levitan, B.I. Levy, J.B. Levy, R.K. Lewis, H.W. Lilliefors, C.D.
T.P.G. Liverman, W.A. MacDonald, N. Mantel *(Research)*, G.E.
R.B. McKay *(Research)*, M.L. Meltzer, J.L. Métivier, Jr., J. Mille
Mondale, R.H. Moore, J.A. Morgan, Jr., J.N. Mosél, D. Nelson, B.
R. Parris, T.P. Perros, E.L. Phillips, F. Prats, R.E. Purcell, J.P.
Jr., B. Reich, W.M. Reynolds, C.E. Rice, J.W. Robb, H.M. Sacha
Sapin, S.O. Schiff, R.H. Schlagel, W.E. Schmidt, L.G. Schwoer
Sharkey, L. Shaw *(Research)*, C. Shih, R.H. Shumway, F.R. Sieg
Silber, H. Solomon, G. Steiner, R.W. Stephens, C.T. Stewart,
Suranyi-Unger, Jr. *(Research)*, C. Taam, G. Teleki, K. Thoenes
Thompson, R. Thornton, R.C. Vincent, R.D. Walk, R.H. Walk
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† This Council serves both Columbian College of Arts and Sciences and the Graduate Sc
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ODUCTION

its founding in 1821, Columbian College of Arts and Sciences, the
l arts college of the University, has continued to expand and develop
the city of Washington. Its central situation makes participation in
ife of the nation's capital convenient for resident students. The cos-
olitan nature of the student body reflects the atmosphere of a great
l capital. Because the students come from the 50 states and from
oreign countries, class discussions and casual student conversations
nriched by a challenging variety of viewpoints.

roughout its history, the College has kept pace with, and often led,
ements of reform in higher education. Sensitive to the rapidly chang-
atterns of student and social needs, notably the increasing maturity
knowledge of the modern incoming freshman, the College has in-
rated sweeping changes in its academic programs. In brief summary,
hanges are designed to (1) permit the able student to earn the bacca-
eate degree in less than the standard four years, either by earning
it through a wide variety of examinations or by performing with
llence within a 90-semester-hour three-year program; (2) provide each
ent with a greater opportunity to design an individual academic pro-
by eliminating almost all specific course requirements except in the
or field; (3) encourage an early and close association between the stu-
and individual faculty members in the field of the student's chief
est; and (4) foster a spirit of community and shared responsibility
veen faculty and student.

pportunities exist for double majors within the College; interdisci-
ary programs; and, in the case of the student who finds no existing
or or program suitable to individual educational goals, special inter-
iplinary programs which may be developed by the student, in con-
ation with departmental advisors and with the final approval of the
mittee on Programs.

olumbian College offers programs leading to the degrees of Associate
Arts, Bachelor of Arts, and Bachelor of Science; prelegal and pre-
ical programs; and the first two years of the professional programs
ublic and international affairs.

olumbian College has degree-granting authority over certain programs
ch combine on-campus and off-campus courses, including the Bachelor
Science in Geodetic and Cartographic Science and the Bachelor of
nce in Oceanography. As most of the courses in the first two years
hese programs are offered on campus, students may be admitted as
-time on-campus students in Columbian College. After the first 64
rs, most of the courses are offered at off-campus locations. Students

are then required to register for their coursework with the Coll
General Studies, which administers off-campus programs. Stude
tending off-campus classes are expected to provide their own trans
tion to and from class. Distances involved vary from two to 20
from the campus area. Columbian College also has degree-granting
rity over two other programs which are usually offered off campu
administered by the College of General Studies: Associate in A
General Studies and Bachelor of General Studies (areas of concent
in economics, history, law enforcement, mathematics, political sc
psychology, and sociology). For further information on all these pro
see the *College of General Studies Bulletin*.

THE COLUMBIAN COLLEGE PROGRAM

The Columbian College program is a contemporary application
historic liberal arts tradition. Its purpose is to enable the student
velop both particular abilities and general awareness as a human
It demands of the student a thorough acquaintance with one majo
of learning and at the same time an understanding of how that spec
tion fits into the larger context of the scientific, social, and moral pro
which confront modern society. It stresses a broadly enlightened
spective which encourages its graduates to grow through the ye
ability and wisdom.

SOPHOMORE YEAR IN PARIS PROGRAM

Freshmen who have received grades of *C* or higher in all course
during the first semester may be eligible to participate in the G
Washington University-American College in Paris Sophomore Yea
gram. Qualified students will be encouraged to accept this opport
to profit from the cultural and intellectual riches of Europe by s
ing their second year living and studying in Paris. Credits earn
this program will be transferrable toward a degree in Columbian C
of Arts and Sciences. Since all courses are taught in English, a know
of French is not mandatory, but is desirable.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the pro
of studies contemplated are required.

Requirements for admission to the freshman class are as follows:

1. An acceptable certificate of graduation from an accredited secon
school, showing at least 15 units* which must include four years of
lish; at least two years of one foreign language; two years of sci
preferably with laboratory instruction; two years of social studies, o

* A unit represents a year's study in a secondary school subject, including in the ag
not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

h must be American history; and two years of college preparatory ematics.

The principal's statement that the applicant is prepared to undertake ge work.

College Entrance Examination Board scores submitted on the Scho- Aptitude Test and the English Composition Achievement Test.

is recommended that the examinations be taken in December or ary. Scores on tests taken in the junior year may be submitted. Ar- ements for tests are the responsibility of the applicant and should be with the Educational Testing Service, Princeton, N.J. 08540; or 1947 r Street, Berkeley, Calif. 94704, not less than one month before the of the test. In applying for the test, the applicant should specify that cores be sent to the Office of Admissions, George Washington Uni- ty, Washington, D.C. 20052.

e College Entrance Examination Board tests are preferred; however, American College Testing battery scores will be accepted. The appli- should request that these scores be sent to the Office of Admissions tly from the American College Testing Program, Iowa City, Iowa. It commended that the applicant take the tests in October of the senior

The Committee on Admission and Advanced Standing will consider dequacy of the qualifications of an applicant who, because of unusual mstances, does not present all of the formal requirements stated on s 68–69. The Committee may prescribe appropriate scholastic-aptitude of the University. Students admitted with deficiencies in secondary ol units will be required to begin removing such deficiencies within irst year, by appropriate courses or examinations.

ULATIONS

ulations regarding admission, registration, fees and finances are stated ages 20–33; other University regulations, on pages 44–53.

OLARSHIP REQUIREMENTS

DEMIC WORK LOAD

ncourage academic performance of high quality, the student's work is limited.

full-time student not on probation may take a course load of as much 7 semester hours. A student employed more than 20 hours a week who ot on probation may take not more than 10 hours.

he amount of work taken by a student on probation may be limited he Committee on Scholarship.

full-time student who, during the immediately preceding semester, has ived no grades below *B* and has earned grades of *A* in three courses ling at least nine semester hours may take 18 or 19 hours. An employed lent who, during the immediately preceding semester, has received no les below *B* and has earned grades of *A* in two courses totaling at least semester hours may take 12 hours.

automatically changed to an *F*. In cases of well-documented exten circumstances, an instructor and a student may jointly petition the or the appropriate committee, for additional time in which to comple work of the course. Such petitions should be submitted within the period. The grade of *I* cannot be removed by reregistering for the c here, or by taking its equivalent elsewhere.

CORRESPONDENCE AND HOME-STUDY COURSES

No credit is given for work done by correspondence or in home-s courses.

CLASSIFICATION OF STUDENTS

A *freshman* is a student who has completed less than 30 semester h A student becomes a *sophomore* upon completion of 30 semester hour student becomes a *junior* upon completion of 60 semester hours. A stu becomes a *senior* upon completion of 90 semester hours.

An *unclassified* student is one who is not a candidate for a bache degree (normally because the student already holds one), but who w for valid academic reason to take a limited program for a limited Registration in this status is permitted only with the prior approval o appropriate Dean's Council.

ADVISORY SYSTEM

Each student is provided with both academic advising and personal c seling. *Academic* advising is performed by members of the faculty sele for their knowledge of academic programs, and each student, before r tration, makes up a program in consultation with the advisor assigne student who has *not* selected a major field receives academic advi from a member of the Columbian College Committee on Student Advi (see page 66). A student who has officially declared a major field rec academic advising from the appropriate department, or from an i departmental committee. *Personal* counseling is available through Office of the Dean of Students or through the University Counseling Ce All students are encouraged to maintain close contact with their advi

Students who intend to transfer after the sophomore year to the Sc of Public and International Affairs are assigned special advisors to a them in planning their programs.

An academic warning system permits early attention to students wh work falls below required standards. In such cases, students are as to consult regularly with their advisors. On request, and with the stude permission, copies of academic warnings or probation notices may be s to parents or guardians, who are themselves welcome to meet with m bers of the advisory staff.

ADEMIC ADVISING CENTERS

h department has set up Academic Advising Centers where both gen- educational counseling and specific major-field advising are available students. The locations and hours of these Centers may be obtained n departmental offices.

As the freshman student deliberates choice of a major, he or she should sult with faculty advisors in as many of these Centers as he or she hes. Once a major is officially declared, the student then receives all demic counseling from the Academic Advising Center of the major partment.

CLARATION OF MAJOR

e student is encouraged to select and officially declare a major field rly, normally no later than the end of the freshman year. All students, wever, whether they are entering freshmen or transfer students, must cure the advisor's signature on a proper form, and return the form to e office of Columbian College in order to declare a major. No student is nsidered to have a major until this process is completed. Thereafter, the dent receives academic guidance from a faculty advisor in the major- ld department.

OLUMBIAN COLLEGE GENERAL COURSE REQUIREMENTS

ll candidates for the degree of Bachelor of Arts or Bachelor of Science e admitted to a general arts and sciences curriculum until they declare major field. Except for two general course requirements, all curriculum quirements leading to the degrees of Bachelor of Arts and Bachelor of cience are established by the various major field departments or pro- ams.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequate hievement in English Composition, either by examination or by taking ngl 9 or 10, and Engl 11 or 12. This requirement may not be postponed.
2. Each student at some point in the college career must undertake a eaningful initiation into the three divisions of knowledge: humanities, atural and mathematical sciences, and social studies. As each major field ill normally represent one of these three areas, the requirement may be lfilled by taking no less than six semester hours in each of the other two reas. These six credits may be in approved introductory courses, or approved advanced courses if the student is qualified and receives the structor's permission. Applied and tool courses do not satisfy the re- uirement for meaningful initiation into the Humanities. All science ourses taken in fulfillment of the meaningful initiation requirement must nclude laboratory instruction. Normally, these six-hour units must be aken in a single subject or department. Courses simply waived (no credit ssigned) cannot satisfy the meaningful initiation requirements. Columbian

College departments and programs are listed below under the three gories.

*Humanities	Natural and Mathematical Sciences	Social Studies
Art	Biological Sciences	American Civilizatio
Classics	Chemistry	Anthropology
East Asian Languages and Literatures	Computer Science	Economics
English	Geology	Geography and Regional Science
Germanic Languages and Literatures	†Mathematics	History
Music	Physics	Journalism
Philosophy	Statistics	Political Science
Religion		Psychology
Romance Languages and Literatures		Sociology
Slavic Languages and Literatures		
Speech and Drama		

Required Placement Examinations

English—Students whose College Board English Composition Ach ment Test scores suggest that they will benefit from more intensive trai in compositional skills may be assigned to Engl 9 or may be teste vocabulary, spelling, grammar, standard usage, and writing skill be placement in either Engl 9 or 10. Students whose scores indicate sup competence will be allowed to waive the Engl 10 requirement. Those w scores indicate markedly superior competence will be allowed to w both Engl 10 and Engl 11 or 12.

Foreign Languages—A student who has not been granted adva standing and who wishes to continue in college the language begun in school must take a placement examination in one of the following: nese, French, German, Greek, Hebrew, Italian, Latin, Russian, or Spa Upon completion of the examination, assignment is made to the approp course.

Mathematics—New students accepted for registration in Math 30, 3 41 are required, prior to registration, to take a placement examinati algebra and trigonometry; those accepted for registration in Math 5 required, prior to registration, to take a placement examination in alg

Foreign Language Requirement

In most major programs requiring foreign languages a student must c plete satisfactorily the equivalent of two years of college work in a s foreign language.

A student offering for admission four acceptable high school units

* Basic language courses (normally the first two years) are considered tool studies and a acceptable in fulfillment of meaningful initiation into the Humanities. Similarly, applied c in art and music are not acceptable in fulfillment of this requirement.
† Math 3, 6 and 30 are not acceptable in fulfillment of meaningful initiation into the Natura Mathematical Sciences.

gle foreign language, or the equivalent, is not required to take any
eign language.
student who offers less than four units and wishes to continue the
e language must take the language placement test.
many instances foreign languages are required or recommended as
paration for advanced work. The student should consult the advisor
hat appropriate foreign languages may be included, when necessary, in
student's program.

st- and Second-Group Courses

st-group courses, those numbered from 1 to 100, are intended primarily
freshmen and sophomores. Second-group courses, those numbered
m 101 to 200, are intended for juniors and seniors. However, a qualified
shman or sophomore may, with the permission of the advisor and of
department concerned, take second-group courses. Such qualification
achieved by passing or waiving introductory courses or prerequisite
urses in the first group.

urses in the Major Field or Department

ery student is given the opportunity of taking a wide range of liberal
s subjects—humanities, natural and mathematical sciences, social stud-
—both as a means of laying the groundwork for more concentrated
jor-field study and as a means of determining what academic area is
st adapted to the student's interests and aptitudes. In order to enhance
s opportunity and to avoid over-specialization once a major has been
ected, at least 60 hours of course work, including the general course
quirements of Columbian College, must be taken outside the major-field
partment or major program. (This does not apply to students in the 90-
ur degree program.)

ofessional Courses

cept for majors in applied mathematics and for students intending to
ply for the combined degree of Bachelor of Arts and Doctor of Medi-
ne, no more than 12 hours of professional courses, e.g., courses offered in
its of the University other than Columbian College, may be included
the hours required for the bachelor's degrees in Columbian College.
udents electing professional courses under this rule must obtain the
proval of the dean before registration.

perimental Humanities/Service-Learning Program

maximum of 21 semester hours in any combination of Experimental
manities courses and Service-Learning Program courses may be credited
ward bachelor's degrees in Columbian College.

rning Credit By Examination

ssuming there is no duplication of coursework earned, a maximum of
semester hours of credit may be assigned for any combination of the
llowing:

College Entrance Examination Board Advanced Placement Tests—C
may be granted for college-level courses taken in an approved secon
school if substantiated by satisfactory performance on the Adva
Placement Tests. See pages 23–24 for further details.

College Entrance Examination Board College-Level Examination
gram (CLEP) -Prior to matriculation, credit may be assigned for
General Examinations, with the exception of the English Composition
amination, passed at the 50th percentile or above. Credit may be assi
for any CLEP Subject Examinations passed at the level recommende
the College Board model policy.

After matriculation, credit for CLEP Subject Examinations will no
assigned without special authorization by the Columbian College de
ment governing the subject involved. See pages 22-23 for additiona
formation.

Special Departmental Examinations—A student may request any de
ment of Columbian College to offer a special examination covering
subject matter of any specific course. (If an appropriate CLEP Su
Examination is available, the department may choose to employ it.)
proval of such a request is not automatically granted; the student
offer evidence of sufficient background to have a reasonable comman
the subject matter. A student who has previously taken examination
waive course requirements may not subsequently take examinations
credit in the same courses. Assigning credit (or waiving a requirement
special departmental examinations will depend on the department's ev
tion of the examination paper. These examinations will normally be
least three hours' duration. A fee of $25 for each course examinati
charged for preparation, administration, and grading of the examinat

Waiving Introductory Courses by Examination

Placement Tests—Many departments in Columbian College, inclu
English, mathematics and all foreign languages, require students to
placement tests to determine level of proficiency or eligibility for spec
courses. The student is placed in an appropriate course on the bas
these tests. There is no charge to the student for placement tests, an
credit (advanced standing) is awarded for courses bypassed or waive
a result of these tests.

Waiver Examinations—Several departments in Columbian College
cluding English, history and sociology, offer periodic waiver examina
for introductory courses. Such examinations may be attempted a
option of the student; a fee of $5 is charged. Specific departments sh
be consulted for further details. *Passing a waiver examination does*
entitle a student to any semester hours of credit.

PREPROFESSIONAL REQUIREMENTS

Students who plan to major in any program offered by the Schoo
Public and International Affairs are registered during the freshman

phomore years in Columbian College. Requirements for the first two ars of these programs, as well as requirements for the premedical pro- am, are listed on the following pages.

emedical Curriculum

premedical student who intends to work toward a bachelor's degree fulfills the general requirements of Columbian College (see pages 73–74), d may follow the major field curricula of any Columbian College partment. Each premedical program must be approved by the pre- edical advisor. For admission to most medical schools the student must ve a minimum of 90 semester hours applicable towards a degree in an proved college of arts and sciences: the 90 hours must include

1. *Biology:* eight semester hours. This may be either in general biology or ology but may *not* include separately credited courses in botany.
2. *Chemistry:* eight semester hours of general inorganic chemistry (which ay include qualitative analysis), including four semester hours of laboratory; d six to eight semester hours of organic chemistry, including laboratory.
3. *Physics:* eight semester hours, including at least two semester hours of boratory.
4. *English:* six semester hours. This may be the usual introductory college ourse or its equivalent.

Many medical schools have additional entrance requirements, among hich are courses in biochemistry, embryology, histology, genetics, and athematics. Even where such courses are not actually required, they are rongly recommended.

With the exception of these specific requirements applicants are urged follow their personal interests in developing their premedical courses f study. A well-balanced program, rather than a specific field, is the riterion by which an applicant is judged. It is not advisable to take ourses that appear to cover subject matter in the medical program.

While well-qualified candidates are eligible for admission after com- leting the minimum 90 semester-hour requirement, the majority of appli- ants are found to be better prepared for the study of medicine after four ears of college work.

hinese Language and Literature

he first two years in preparation for the Bachelor of Arts degree with a ajor in Chinese Language and Literature in the School of Public and nternational Affairs consists of a minimum of 60 semester hours. Each tudent must, during the freshman year, demonstrate adequate achieve- ent in English Composition, either by examination or by taking Engl 9 r 10, and Engl 11 or 12. The student must also undertake a meaningful nitiation into the three divisions of knowledge: Humanities, Natural and Mathematical Sciences, and Social Studies. As the major field represents ne of these three areas, the requirement may be fulfilled by taking no ess than six semester hours of approved introductory courses, or six emester hours in approved advanced courses if the student is qualified nd receives the instructor's permission, in the Natural and Mathematical Sciences and in Social Studies. Students must include in their program

of study Chin 1-2, 3-4, and 9; Chin 7-8 and 9; or Chin 5-6. Chin preferred.

East Asian Studies or International Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the of East Asian Studies (China and Japan) or International Affairs in School of Public and International Affairs:

Engl: Humanities or AmCv:	Engl 9 or 10, and 11 or 12 ..... Art 31–32 or 71–72; *Literature (American, Chinese, East Asian, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60; or AmCv 71–72 .....
†Language:	Chinese, Japanese, French, German, Hebrew, Italian, Russian, or Spanish .....
Math/Science:	BiSc 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; or one course selected from Stat 51, 53, 91, and one course selected from Stat 97, 105, 111 .....
Social Studies:	Econ 1–2; Hist 40 and 72; PSc 1 and 2, or 2 and 3 .....
‡Elective:	.....
	Total .....

Public Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the of Public Affairs in the School of Public and International Affairs:

Engl: Humanities or AmCv:	Engl 9 or 10, and 11 or 12 ..... Art 31–32 or 71–72; *Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group Philosophy courses; Rel 21, 59–60; AmCv 71–72 .....
Language or Statistics:	..... NOTE: This requirement may be satisfied by two years of one foreign language§ or 12 semester hours of Statistics. Statistics courses taken to fulfill this requirement may not also satisfy the math/science requirement below.
Math/Science:	BiSc 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; or one course selected from

* If a student elects six semester hours of literature in any foreign language, this cannot be to satisfy the language requirement.

† Chin 5-6 is required for East Asian Studies (China focus) majors; Japn 3-4 is required for Asian Studies (Japan focus) majors. Greek and Latin are not acceptable for International A majors.

‡ Credit is not given for courses elected in the Department of Human Kinetics and Le Studies.

§ Greek and Latin are not acceptable for Public Affairs majors.

	Stat 51, 53, 91, and one course selected from Stat 97, 105, 111	6–8
ocial Studies:	Econ 1–2; Hist 40 and 71–72; PSc 1 and 2, or 2 and 3	21
*Elective:		7–9
	Total	60

ban Affairs Curriculum

st two years in preparation for the Bachelor of Arts degree in the field Urban Affairs in the School of Public and International Affairs:

Engl:	Engl 9 or 10, and 11 or 12	6
Humanities or AmCv:	Art 31–32 or 71–72; Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group Philosophy courses; Rel 21, 59–60; or AmCv 71–72	6
Math/Science:	BiSc 3-4 or 11–12; Chem 3-4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10 NOTE: If a student elects two years of a foreign language, two semesters of Statistics courses may be substituted for the Math/Science requirement.	6–8
ocial Studies:	Econ 1–2, Hist 71–72, and PSc 1 and 2, or 2 and 3 Six semester hours selected from the following:	18
	Hum 40, 51–52, Soc 2	6
*Elective:	Students may substitute some of the required courses for the major (see pages 168–69) for elective courses during the sophomore year	16–18
	Total	60

EGREE PROGRAMS

SSOCIATE IN ARTS DEGREE

he Associate in Arts Degree may be granted to a student who has completed 60 semester hours in arts and sciences with acceptable grades, and ho has fulfilled the general requirements described on pages 73–74. In ddition, the degree may be awarded to pre-public and international affairs students upon completion of the curriculum specified for the first wo years of the appropriate program. The last 15 semester hours of the rogram of study must be completed in residence in Columbian College. student wishing to receive this degree must file an Application for raduation and pay the $10 graduation fee at the time of registration for he semester or summer session in which the requirements will be completed.

HE BACHELOR'S DEGREES

olumbian College offers programs leading to the degrees of Bachelor of rts and Bachelor of Science.

Credit is not given for courses elected in the Department of Human Kinetics and Leisure tudies.

In cooperation with the School of Medicine and Health Scienc seven-year curriculum leading to the combined degrees of Bachelo Arts and Doctor of Medicine is offered.

Requirements for the Degrees

SCHOLARSHIP

One hundred and twenty hours of coursework must be passed a quality-point index of 2.00 achieved in courses graded on a four- scale. At least 60 hours of coursework, including the general cours quirements of Columbian College, must be taken outside the major department or major program.

The index is obtained by dividing the number of quality points b number of semester hours of courses passed with grades of *A*, *B*, *C*, which the student submits for graduation. Both the number of qu points and the number of semester hours of courses are based on the dent's record at this University. The index is computed as follows: *A*, points; *B*, three points; *C*, two points; *D*, one point; for each semester which the student has taken. Courses marked *F*, *W*, *I*, *NC*, or *CR* ar considered in determining the index, though courses passed with *CR* toward the 120-hour overall requirement. (When a formal grade is corded for an Incomplete, a grade of *D* or better will be included in computation of the index.) A grade of Incomplete which is not rem within one semester is automatically changed to an *F*. Grades earne courses taken at another institution are not considered in computing index. See page 84 for scholarship requirements applicable specifica departmental majors.

RESIDENCE

For the Standard 120-semester-hour Program—A minimum of 30 mester hours, including at least 12 hours in the major field, must be pleted in residence in Columbian College. *Unless special permissi granted by the dean to pursue work elsewhere, the work of the s year must be completed in residence.* This requirement applies to stu transferring within the University as well as to students transferring other institutions.

For the 90-semester-hour Program—The last 60 semester hours, incl at least 12 hours in the major field, must be completed in residen Columbian College.

Summer work may be counted in residence. For regulations gover students who are absent from the University for one semester or m see "Continuous Registration," page 49.

CURRICULUM REQUIREMENTS

A change in degree candidacy within Columbian College (e.g., from Ba lor of Arts to Bachelor of Science) requires the permission of the

degree requirements effective at the time the change is approved
t be met.
irst-group courses may be required as prerequisites to the major, but
ause of their introductory character they cannot be counted as part of
h programs. (See "Explanation of Course Numbers," page 194.)

EDIT/NO CREDIT OPTION

unior or senior student in Columbian College who is in good standing
y, with the approval of his advisor and the Dean, take one course a se-
ster and receive a grade of *CR*, Credit, or *NC*, No Credit. No student
l be allowed to take more than four credit/no credit courses under this
ulation. The student may, however, in addition receive grades of *CR*/*NC*
the proseminar for field-of-study majors and in other courses normally
ng such grades. A student must sign up for the credit/no credit option
registration. Under no circumstances may a student change from
edit/no credit status to graded status, or vice versa, after the end of
gistration. Courses required in the student's major field (courses re-
ired in the major department or those required outside the major de-
rtment) may not be taken on the credit/no credit basis. A transfer stu-
nt may not chose this option until the second semester of enrollment in
s University.

TORIAL STUDY

junior or senior of demonstrated capacity, with a special interest in the
bject matter of a regularly listed course, may be permitted to take tu-
rial study in residence under the personal direction of the instructor,
accordance with the rules of the appropriate department and with the
pproval of the Dean. Credit under this plan is limited to the specific
mester hours of credit designated for each course in the list of courses
instruction. It assumes frequent and regular conferences between the
udent and instructor.

HE STANDARD 120-SEMESTER-HOUR PROGRAM

ne hundred and twenty semester hours of course work are required for
raduation. At least 60 hours of course work, including the requirements
ated on pages 73–74, 79–80, must be taken outside the major department
r program. The student should consult the advisor at each registration
bout choice of courses.

Each student should declare a major as soon as possible, preferably upon
ompletion of 30 semester hours. A student may change the major only
vith the consent of the Dean and of the department or committee con-
erned, and the student must meet the requirements for the new major
n effect at the time the change is approved.

Students transferring from other institutions or from other schools,
olleges, or divisions in this University, with major requirements wholly
r substantially met, must satisfy the residence requirement of Columbian
College (see page 80).

THE 90-SEMESTER-HOUR PROGRAM

The 90-semester-hour degree program is designed for the exceptio able student. This program, which leads to the regular Columbian Co degrees, makes it possible to graduate in three normal academic y with a total of 90 semester hours of credit instead of the standard Students in this program must complete all of the requirements for three-year degree in the semester in which the 90th semester hou achieved.

The requirements for this program are (1) 90 semester hours of c earned in college courses (that is, the 90-hour requirement may not be duced by credit earned through examinations); (2) completion of the ch major-field program and general curricular requirements; (3) grades of at least 45 semester hours of course work and no grades below C; (least 60 semester hours of credit earned in 100-level courses; and (5) ommendation of the major department or program.

To be eligible for this program, the student must show evidence of ceptional academic ability by college record, performance in co courses, and other appropriate information.

An interested student should make application directly to the ma field departmental chairman or program director as soon as poss preferably by the end of the first year of study. The student's acad record to that point will, of course, provide a useful criterion of eligibi

A transfer student may qualify for graduation under the 90-hour prog provided the student satisfies the residence requirement of Columbian lege (see page 80), earns grades of *A* in no less than 45 semester hour course work at this University and has no grades below *C*.

A student who fails to maintain the required academic performa while studying toward the 90-hour degree program simply continues the standard 120-hour degree.

Bachelor of Arts

The Bachelor of Arts degree is offered in the following fields:

American Civilization
American Literature
Anthropology
Applied Mathematics
Applied Statistics
Art History
Biology
Botany
Chemistry
Chinese Language and Literature
Classical Archeology and Anthropology
Classical Archeology and Classics
Classical Humanities
Dramatic Art
Economics
English Literature
Environmental Studies
History
Journalism
Judaic Studies
Latin American Studies
Mathematical Statistics
Mathematics
Music:
- Applied Music
- Music History and Literature
- Music Theory

Philosophy
Physics
Political Science
Psychology
Religion
Russian Language and Literature
Russian Literature and Culture—in Translation
Sociology

- Arts
- ıch Language and Literature
- graphy
- logy
- manic Languages and iteratures
- Spanish American Literature
- Spanish Language and Literature
- Speech Communication and Broadcasting
- Speech Pathology and Audiology
- Statistics (Computer Science option)
- Zoology

nbined Degrees of Bachelor of Arts and Doctor of Medicine

candidate for the combined degrees of Bachelor of Arts and Doctor of dicine must (1) complete the entrance requirements for the Doctor of dicine degree in the School of Medicine and Health Sciences; (2) com- te the general requirements stated on pages 73–74, 79–80; (3) accumu- 90 semester hours in the liberal arts, including a minimum of 30 in ond-group courses in Columbian College; (4) obtain the approval of Dean of Columbian College at the time of entering the School of dicine and Health Sciences; (5) obtain the recommendation of the Dean Academic Affairs of the Medical Center at the completion of all pre- ibed courses in the first year of the School of Medicine and Health ences, at which time the degree of Bachelor of Arts will be conferred ofessional work taken at another institution will not satisfy the major uirement of the combined degrees); (6) maintain throughout the entire ırse the scholarship level required for graduation.

chelor of Science

e Bachelor of Science degree is offered in the following fields:

- Applied Mathematics
- Applied Statistics
- Biology
- Botany
- Chemistry
- Environmental Studies
- Geology
- Geology (Engineering option)
- Mathematical Statistics
- Mathematics
- Physics
- Zoology
- Statistics (Computer Science option)

ıe Undergraduate Major

ıere are two types of undergraduate majors: the Field-of-Study major ıd the Departmental major. Five majors—Classical Archeology and An- ropology, Classical Archeology and Classics, Environmental Studies, daic Studies, and Latin American Studies—although interdepartmental nature, are governed by the regulations of the Departmental major.

ELD-OF-STUDY MAJOR

ach Field-of-Study major covers a carefully worked out field of coordi- ated study and is under the supervision of the appropriate department ıd the Columbian College Committee on Studies.

The Field-of-Study major requires no specific program of courses, al- ıough the student is required to meet the over-all general requirements ır the degree. Ability to pass the Major Examination is assumed to be a

convincing demonstration that the student possesses the breadth, d and quality of knowledge of the major usually defined in terms of sem hours, courses, and grades. Information on each field is obtainable the department. Immediately upon declaring a major, students should sult the appropriate department so that they may be assigned an adv

The Field-of-Study major places special emphasis on the intelle development of the individual student. Programs in the same major vary, depending upon the individual student's background, previous st and aptitudes. The student is expected to consult the advisor freque and the special proseminars offered in some fields give the student fu opportunity for individual advice and direction in pursuing a pro especially adapted to individual needs and abilities. A close stu advisor relationship is essential for the student's success under Field-of-Study major plan.

The following Field-of-Study majors are offered: American Civiliza American Literature, Chinese Language and Literature, English Litera French Language and Literature, History, Religion, Russian Language Literature, Russian Literature and Culture—in Translation, Spanish Am can Literature, Spanish Language and Literature.

Proseminar in the Major.—A proseminar is offered in most fields to the student acquire a coordinated knowledge of the chosen field thr reading, study, and laboratory exercises. It is a presentation of the con and methods of the major field as a whole through the organization coordination of the knowledge obtained in the various formal cours the major subject and of material not usually included in such cou This course is not required, but, if it is elected, strict attendance is es tial. Six semester hours, but no qualitative grade, may be assigned. W registered in this course, the student has the privilege of visiting, sub to the approval of the instructor, any other appropriate course offere the College. (Regular attendance in a course, either for credit or a auditor, requires registration and payment of tuition.) Proseminars open only to the student who has been accepted as a candidate under specific major.

The Major Examination—The Major Examination will normally be t at the close of the senior year; a student on a limited schedule may ta no earlier than one calendar year before graduation. A student who to pass a Major Examination may, at the discretion of the Committe Studies, be re-examined at a later regular major-examination period. Committee on Studies has general supervision of the preparation, read and grading of Major Examinations. Major Examinations are held e semester on dates fixed by the department or departments concerned, in no case later than December 1 for the fall semester, April 13 for spring semester, and August 26 for the summer sessions.

DEPARTMENTAL MAJORS

Departmental majors, unlike Field-of-Study majors, are defined in term credit hours, required courses, and the attainment of grades no lower C in the minimum required second-group courses taken in the major fi A *D* in a required course will satisfy a curricular requirement in the ma

t will not count toward the minimum number of hours required in the
or. (A department may require a degree candidate to repeat a required
se in which a *D* was received. See page 45.) The minimum specific
irements for Departmental majors are listed below the staff of instruc-
of the department concerned. The chairman of the department, or
gnated departmental advisor, should be consulted at registration con-
ing the student's program of courses; and the entire program, including
tives, must be approved by the department. The student is also ex-
ed to consult the chairman or advisor in all matters affecting the pro-
n of studies, such as changes, substitutions, or withdrawals, and espe-
ly concerning the student's progress in a course. A close student-
isor relationship is desirable.

epartmental majors are offered in the following: American Literature,
hropology, Applied Mathematics, Applied Statistics, Art History, Bi-
gy, Botany, Chemistry, Classical Archeology and Anthropology (inter-
artmental), Classical Archeology and Classics (interdepartmental),
ssical Humanities, Dramatic Art, Economics, English Literature, En-
nmental Studies (interdepartmental), Fine Arts, Geography, Geology,
logy (engineering option), Germanic Languages and Literatures, His-
, Journalism, Judaic Studies (interdepartmental), Latin American Stud-
(interdepartmental), Mathematical Statistics, Mathematics, Music (Mu-
History and Literature, Music Theory, Applied Music), Philosophy,
sics, Political Science, Psychology, Russian Language and Literature,
iology, Speech Communication and Broadcasting, Speech Pathology
Audiology, Statistics (computer science option), Zoology.

UBLE MAJORS

th the prior approval of the departments concerned, a student who
npletes the requirements of two major fields in Columbian College (for
mple, mathematics and physics, or English and Latin, or history and
nomics) may graduate with a double major. Such a student should
sult with advisors in the two departments concerned and officially
clare both majors on the appropriate forms available in the dean's
ice. A double major must be taken in departments offering the same
gree (either the B.A. or the B.S.); a major field in Columbian College
not be combined with a major field offered by another degree-granting
it of the University.

TERDISCIPLINARY PROGRAMS

Regular Interdisciplinary Programs—Several programs presently exist,
cluding American Civilization, Classical Archeology and Anthropology,
assical Archeology and Classics, Environmental Studies, Judaic Studies,
d Latin American Studies.

Special Interdisciplinary Programs—A student who finds no existing
ajor or program suited to individual educational goals may develop a
ecial major program, in consultation with appropriate departmental ad-
sors. Final approval of such a program rests with the Committee on Pro-

grams. Only programs with valid and clearly defined academic goals be approved, and each shall be designated by a title suggested by student to the Committee on Programs for approval. Because of t broad scope, such interdisciplinary majors may not be combined wi double major.

A student in an interdisciplinary program will be expected, during second semester of the senior year, to take a comprehensive examina (either oral or written) in the interdisciplinary field, or to undertake a ior comprehensive thesis, at the discretion of the student's interdep mental committee.

Special Interdisciplinary Courses—Under the supervision of the C mittee on Programs, new courses will be offered each semester combi the methods and insights of several disciplines. Interested students sh consult the current *Schedule of Classes*, where they will find such cou numbered 701 and 721.

GRADUATE SCHOOL OF ARTS AND SCIENCES

Dean H. Solomon
Assistant Deans A.D. Andrews, E.A. Caress, D.A. Rowley

FACULTY AND CONSULTANTS

Faculty*

Professors E. Abravanel, L.F. Affronti, E.N. Albert, F.D. Allan, J.G. Al Jr., J. Aschheim, J.M. Bailey, Jr., R.L.A. Bari, O. Bergmann, L.S. Bowl H.F. Bright, R.G. Brown, J.F. Burks, W.E. Caldwell, G.V. Carroll, M. Cassidy, I.H. Cisin, A.G. Coates, V.H. Cohn, J. Cornfield, T.F. Courtl Jr., R.H. Davison, L.G. DePauw, A.H. Desmond, R.M. Dunn, Jr., J. Eis stein, S.E. Fabro *(Research)*, N. Filipescu, J.A. Frey, R.N. Ganz, Jr., Gastwirth, M. Gordon, S.W. Greenhouse, F. Griffith, F.S. Grubar Gyorgy, R.C. Haskett, R. Hertz *(Research)*, P.H. Highfill, Jr., P.P. H J.W. Hillis, H.C. Hinton, H.H. Hobbs, M.A. Holman, C. Hsieh, R. Hu I. Katz, T.N. Johnson, R.G. Jones, J.W. Kendrick, R.A. Kenney, R. Kenny, H. Kenyon, Y. Kim, J.C. King, A.D. Kirsch, R.M. Krulfeld, T. Lavine, H.L. LeBlanc, L.P. Leite *(Emeritus)*, P.H.M. Lengermann, E. Lerner II, S. Levitan, B.I. Levy, J.B. Levy, R.K. Lewis, H.W. Lillie

* The President of the University, the Vice President for Academic Affairs, the Registrar o University, the Director of Admissions of the University, and the University Librarian ar officio members of the Faculty of the Graduate School of Arts and Sciences

C.D. Linton, T.P.G. Liverman, W.A. MacDonald, H.G. Mandel, P. Mazel, G.E. Mazzeo, M.L. Meltzer, J.W. Millar, F.N. Miller, J. Miller, Jr., C.C. Mondale, J.A. Morgan, Jr., J.N. Mosél, D. Nelson, B. Nimer, C. O'Rear, R. Parris, T.P. Perros, V. Petrov, E.L. Phillips, F. Prats, R.E. Purcell, J.P. Reesing, Jr., B. Reich, C.E. Rice, J.W. Robb, M.L. Robbins, H.M. Sachar, B.M. Sapin, S.O. Schiff, R.H. Schlagel, W.E. Schmidt, L.G. Schwoerer, R.P. Sharkey, R.H. Shumway, H. Sidransky, F.R. Siegel, G. Sigur, D.E. Silber, B.W. Smith, R.S. Snell, H. Solomon, G. Stambuk, J.E. Starrs, G. Steiner, R.W. Stephens, C.T. Stewart, Jr., J.A. Straw, C. Taam, G. Teleki, K. Thoenelt, R.B. Thompson, R. Thornton, C.S. Tidball, M.E. Tidball, C.R. Treadwell, G.V. Vahouny, R.D. Walk, R.H. Walker, Jr., D. Wallace, Jr., R.A. Wallace, E.R. Weismiller, D.G. White, R.E. Wood, H.B. Yakobson, H.E. Yeide, Jr., A.J. Zuchelli

djunct Professors T.E. Bowman, J.C. Broderick, F.A. Chace, Jr., R.G. Crystal, W.G. Flamm, R.C. Gallo, D. Gillespie, E.G. Kauffman, W.M. Leach, C.D. Lytle, C.G. McWright, J. Minna, J.C. Pettricciani, J.W. Pierce, H.A. Rehder, I.G. Sohn, G. Todaro

ssociate Professors F.P. Abramson, Y. Al-Doory, A.D. Andrews, D.L. Atkins, S.R. Barnett, J.R. Barth, A.D. Britt, E.A. Caress, Y. Chu *(Research)*, M.A.B. Coffland, C.F. Elliott, R.S. French, I.I. Glick, R.S. Goldfarb, V.K. Golla, M.D. Green, W.B. Griffith, S.E. Haber, R.A. Hadley, D.R.K. Henney, C.J. Herber, A.J. Hiltebeitel, R.W. Holmstrom, K. Huang, T.L. Hufford, R.L. Humphrey, Jr., C.T. Ireland, M.J. Jackson, W.R. Johnson, H.D. Junghenn, S.A. Karp, S.G. Kent, N.K. Khatcheressian, P.D. Kind, P.F. Klarén, P. Klubes, R.E. Knowlton, M.J. Koering, R.A. Lavine, M.P. Lee, D.R. Lehman, J.F. Lewis, C.A. Linden, R.C. Lindholm, J.M. Logsdon, W.F.E. Long, J.C. Lowe, G. Ludlow, J.H. Maddox, J.J. McMillan, H. Merchant, B.M. Mergen, C.A. Moser, N.N. Natov, H.R. Nau, G.A. Olkhovsky, R.K. Packer, W.C. Parke, E.O. Pederson, C.H. Pfuntner, J.A.A. Plotz, J.A. Quitslund, M. Reich, E. Reuben *(Visiting)*, L. Rothblat, D.A. Rowley, P.G. Sáenz, S.L. Simons, C. Steiner, C.W. Sten, E.A. Stone, D.H. Teller, I. Thompson, N.A. Tilkens, C.E. Tuthill, G.A. Walker, D.W. Watkins, S.J. Wayne, A.M. Yezer, R.Y. Yin, B.C. Zook

djunct Associate Professor J. Schlom

ssistant Professors R.J. Anderson, I. Azar, S.R. Barnett, M.E. Boeckmann, L. Brandt, A.S. Brooks, A.R. Bruhn, S.W. Burks, G. Carter, R.L. Combs, R.E. Darcy, R.F. De Giovanni-Donnelly *(Research)*, J.P. Dirkse III, G.S. Edwards, L.L. Gallo, N.C. Garner, H.I. Gates, H.F. Gillette, Jr., S.K. Green, F. Griffith, H.C. Harder, S. Hashtroudi, C.B. Jacobson, J.M. Kerns, N. Lappas, D.L. Lee, M.R. Loeb *(Research)*, G.C. Mackenzie, D. McAleavey, C. McClintock, D.A. Neufeld, M.D. Olson, G. Paster, P.J. Poppen, W.F. Rowe, J.R. Schneider, J. Shaffer, A.H. Smith, J.M. Starrels, P.L. Stewart, A.M. Suria, M.F. Taragin, J.L. Tropea, W.T. Woodward, J.F. Wright, Jr.

djunct Assistant Professors T.B. Friedman, K. Krell, H.Y.L. Kwiatkowska, C.R. Merril, E. Ulman

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Consultants in Research

J. Adkins, E.P. Anderson, W.F. Anderson, A.A. Ansari, F. Arnhoff, Back, J.L. Barnard, C. Bell, J. Bellanti, L. Bilker, E.J. Blanchette-Ma L. Bockstahler, C. Boone, W. Bowman, R. Brady, Jr., D. Brandes, Brightman, C.P. Butcher, B. Collette, C. Dawe, G.C. Eads, G.A. E J. Farrar, M.R.S. Fox, V. Frattali, J.E. Fredland, F.N. Frenkiel, R. Gibbs J. Goldstein, R. Goldstein, J. Granger, T.J. Greenwalt, G. Guroff, J. H H.F. Haviland, Jr., J.E. Hazel, R. Herberman, L. Horton, R. Houbt T. Hunt, L.C. Johnson, M.L. Jones, S. Jong, R.K. Kahn, M. Kende, D. Ko J. Ladik, J. Lambert, L.S. Lessin, R. Levy, E. Lewis, D. Liu, W.M. Lo berg, W. Madow, R. Mage, C.R. Martin, L.L. Marton, L. McGowan Meecker, W. Mertz, J. Minna, M. Mishkin, A. Morales-Carrion, W.G. N S. O'Reilly, J. Parker II, D.B. Parsons, A. Peacock, R.L. Peters, J. Pis C. Polge, M. Potter, R.M. Pratt, Jr., P. Price, H. Rabin, M. Rabinovitz, Rall, A. Raskin, A. Richman, C. Romney, J. Rosenbluth, P. Russell, P. Sa L.P. Schultz, D.B. Scott, J.E. Seegmiller, R.S. Sigafoos, L.B. Smith Sokoloff, H. Sprinz, D.F. Squires, R. Stern, S. Stewart, T.D. Stewart, Storrs, K.K. Takemoto, J. Thomas, R. Ting, A.J. Tousimis, E. Umbe S. Vadlamudi, J. Van Buren, H. Viola, L. von Sallmann, W.E. Washb M. Webster, H. Weissbach, S.H. Weitzman, M.L. Wolbarsht, L.E. Zim man

Field of Studies Consultants

C. Carson, G. Evans, A. Fern, J. Fulton, F.R. Goff, A. Jabbour, J.B. Ku V. McKay, J.W. Witherell

HISTORY AND ORGANIZATION

The Graduate School of Arts and Sciences is responsible for adva study and research leading to Master's degrees and the degree of Do of Philosophy in the arts and sciences. Graduate programs at Geo Washington University were first formally organized under the Grad School in 1905, following several decades of gradual growth in a num of departments. In 1930 the Graduate School was discontinued. Colum College, the University's liberal arts college, then assumed responsib for the Master of Arts and Master of Science degrees, and a newly cre Graduate Council administered all Doctor of Philosophy programs. fessional schools took responsibility for advanced degrees in the pro sional fields.

In 1967 the Graduate Council and the Graduate Division of Colum College were consolidated into a new Graduate School of Arts Sciences. All graduate programs in the arts and sciences leading to degrees of Master of Arts, Master of Arts in Special Studies, Maste Fine Arts, Master of Forensic Sciences, Master of Music, Master of ence, Master of Science for Teachers, Master of Science in Fore Science, Master of Science in Special Studies, and Doctor of Philoso are under the Graduate School.

In addition, a Master of Philosophy degree is awarded by the Sch upon recommendation of the appropriate department, to students

ve successfully completed the General Examination for the Doctor of ilosophy degree.

The School is under the direction of the Graduate Faculty of Arts and iences. It is the responsibility of the Faculty to set the requirements for mission to the School, to provide courses and programs of study and search for its students, to establish academic standards for its degrees, recommend to the Board of Trustee the awarding of degrees, to lay wn regulations as needed for the operation of the School, and generally supervise its activities.

The administration of the School is vested in the Dean, who is Chairman the Dean's Council, which is responsible to the Faculty of the School r all policy matters.

DMISSION REQUIREMENTS

pplication forms for admission to graduate study are obtained from the ffice of the Dean of the Graduate School of Arts and Sciences. When ompleted, these application forms must be submitted to this Office, to-ether with college transcripts and letters of reference.

Applicants must have academic backgrounds of excellence, usually with ajors, or equivalent, in the fields in which they intend to study for ad-anced degrees. Normally, a *B* average (or equivalent) from an accredited ollege is required. With evidence of special promise, such as high Gradu-te Record Examination scores, an applicant may be accepted whose cademic record falls short of *B*. The minimum does not assure automatic cceptance. The departments may, and often do, set higher admission tandards. Moreover, the number of spaces available for new graduate tudents limits the number that can be accepted. Students who apply in heir senior year must have completed their baccalaureate work before egistration in the Graduate School and must present evidence of such ompletion. Students whose native language is not English are required to ake the *Test of English as a Foreign Language* (TOEFL), administered by he Educational Testing Service, Princeton, N.J. (see pages 25–27).

Application for Admission—Applicants who are requesting fellowship upport must submit completed applications by February 15 (February 1 or students in clinical psychology and art therapy) for admission in the all semester and by November 1 for admission in the spring semester. Applicants for the on-campus Master of Arts in Special Studies must have ll application materials in the Graduate School office by July 15 for the all semester, November 1 for the spring semester and April 15 for the summer sessions. Applications for graduate study without fellowship sup-port made after these dates are acceptable for admission in the corre-sponding semester and will be reviewed if time permits and if space is vailable in the program desired. More time than normal may be required o process applications submitted during July and August.

Readmission—A student who has failed to maintain continuous registra-tion and wishes to resume a graduate program must file an application form to be considered for readmission. Readmission is not guaranteed, and the application is subject to review by the department concerned and the Dean. The student may be required to take qualifying examinations

on the course work completed. Application forms are available in Graduate School Office.

REGULATIONS

Regulations regarding admission, registration, fees, and finances are st on pages 20–33; other University regulations, on pages 44–53.

In addition, the Graduate School publishes a Student Handbook academic year which contains updated information on the Scho policies, regulations, and other matters of concern to enrolled or admi students. It is the responsibility of the student to be aware of the infor tion contained in the catalogue and handbook.

Grades

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass Fail; *I*, Incomplete; *W*, Authorized Withdrawal; *CR*, Credit.

The symbol *I* (Incomplete) indicates that a satisfactory explanation been given to the instructor for the student's failure to complete the quired work for a course. The "Incomplete" must be made up before lapse of one calendar year. An "Incomplete" which is not removed wi one calendar year remains as a grade of *I* on the student's record. grade of *I* cannot be removed by reregistering for the course here, or taking its equivalent elsewhere.

The grade of *I* is also given for all thesis and dissertation resea courses until the thesis or dissertation is completed. Upon the satisfact completion of the thesis or dissertation the grade *I* is changed to automatically. The grade of *CR* is given for an *Advanced Reading Research* (usually numbered 398) course.

Scholarship Requirements

Graduate students are required to maintain a minimum accumulative gr average of *B* (3.00) in all course work taken following admission to Graduate School. Individual departments may require a higher aver The fields of art history, English, history, and psychology require a average.

In the case of a student who receives a grade of *F* for a course in program of studies, the Graduate School will require a written statem from the department justifying the student's continuance in the Grad School and outlining the program to be followed. Continuation is continge upon the Dean's approval. A course in the program of studies for which *F* is received cannot be subsequently removed from the program e though another course is taken as a substitute.

A student may repeat for credit a course in which a grade of *C* or abo was received only when permitted to do so by the department concern unless the course description states that the course may be repeated credit. A written statement to this effect must be submitted for approval the Dean's Office by the appropriate departmental advisor. It is then fil with the Registrar. If a course is repeated for credit, the first grade ceived remains on the student's record.

A graduate student may take an advanced undergraduate course (courses mbered 101-200) for graduate credit only upon the approval of the Dean d the department at the time of registration. Such approval is granted ly with the provision that students complete additional work in order to ceive graduate credit.

ogram of Studies

he program of studies must be approved by the dean and the departental advisor and filed in the Graduate School Office no later than ovember 1 for graduate students entering in the fall semester, or March for graduate students entering in the spring semester. A program of udies may be revised, when necessary, by obtaining the approval of the epartmental advisor and the Dean. The revision must be filed in the raduate School Office.

ontinuous Registration

ll students must maintain continuous registration while working toward degree, except during the summer session. If continuous registration is ot maintained, the student is dropped from the degree program unless eave of absence is granted by the Graduate School.

eave of Absence

f a student is temporarily unable to continue the program of studies, the tudent may request leave of absence for a specific period of time, not o exceed one calendar year. An exception is made for students granted nilitary leave. A student who is called to active duty may be granted nilitary leave (see page 49) for the duration of the period of military duty pon presentation to the Graduate School of a copy of the military orders nd a request for such leave. When the period of leave has expired, it is he student's responsibility to notify the Graduate School at least two nonths in advance of a given registration period of an intention to reegister. If a student fails to re-register, the candidacy is terminated.

Withdrawal

Graduate students who intend to withdraw from the Graduate School should inform the School in writing. The last day for complete withdrawal without academic penalty is at the end of the eighth week of classes.

Graduation Requirements

All students must file an Application for Graduation and pay the required graduation fee at the time of registration for the last semester or summer session of the final year in which they intend to graduate. Students must be registered in the Graduate School during the semester they plan to graduate. Master's and doctoral candidates may graduate in May, February, or September. Students who have completed the requirements for a degree but have not yet been awarded the degree will be issued a letter to this effect upon request.

DEGREES

Listed below are the degree programs of the Graduate School of Art Sciences and the specific degrees offered, by field. The programs a rected by the departments concerned. Degree programs which bridge or more departments are directed by committees composed of mem of the departments concerned. For further information write to the or the chairman of the appropriate department.

The degrees of Master of Arts in Special Studies and Master of Sc in Special Studies are designed for students who do not wish to con trate in a specific field such as those listed below, but instead are i ested in interdisciplinary programs. It is possible to group several of fields together to make an interdisciplinary program; the progra studies is determined by the student in consultation with the Sp Studies Program Steering Committee. The student may choose cou from those fields pertinent to the student's academic goal; howev student cannot have more than one-third of the courses from any department. The student must obtain permission to take the courses the appropriate departments. A one-semester seminar on interdisciplin methods, for which no academic credit is given, is required of all stud

The Graduate School of Arts and Sciences offers programs of stud campus leading to the degree of Master of Arts in Special Studies concentrations in Criminal Justice, Human Resources Develop Women's Studies, and Philosophy and Social Policy. The School also o Master of Arts and Master of Science in Special Studies degrees in spe academic areas at off-campus locations (see pages 100–101).

Graduate Fields

The graduate course work offered in support of the degree program the following list is shown by department in this catalogue.

I. Humanities	Degrees Offe
American Civilization	M.A.
American Literature	M.A.
Art:	M.F.A.
Ceramics	
Design	
Graphics	
Painting	
Photography	
Sculpture	
Art History	
Classical Archeology, Classics and History	M.A.
Dramatic Art	M.A.
English Literature	M.F.A.
*French Literature	M.A.
Germanic Languages and Literatures	M.A.
History of Religions—Hinduism	M.A.
Museum Studies	M.A.

* Any approved combination of French, Spanish, or Spanish American Literature is av as a Doctor of Philosophy field

sic:	Mus.M.	
Applied Music		
Composition		
Conducting		
Music Theory		
usicology	M.A.	
ilosophy	M.A.	
ligion	M.A.	
eligion and Medical Care	M.A.	
eligious Education	M.A.	
ussian Language and Literature	M.A.	
panish American Literature	M.A.	Ph.D.
panish Literature	M.A.	Ph.D.

ocial Sciences

nthropology	M.A.	
conomics	M.A.	Ph.D.
ducation Policy		Ph.D.
eography	M.A.	
istory	M.A.	Ph.D.
nternational Relations		Ph.D.
olitical Science	M.A.	Ph.D.
ociology	M.A.	Ph.D.

Physical and Mathematical Sciences

Applied Mathematics	M.A., M.S.	
Applied Statistics	M.S.	
Chemistry	M.S.	Ph.D.
Engineering Geology	M.S.	
Forensic Sciences	M.F.S., M.S.F.S.	
Geochemistry	M.S.	Ph.D.
Geology	M.A., M.S.	Ph.D.
Mathematical Statistics	M.A.	Ph.D.
Mathematics	M.S. for Teachers, M.A.	Ph.D.
Physics	M.A.	Ph.D.

Biomedical and Related Sciences

Anatomic Pathology	M.S.	
Anatomy		Ph.D.
Art Therapy	M.A.	
Biochemistry	M.S.	Ph.D.
Biological Sciences	M.S.	Ph.D.
Genetics	M.S.	Ph.D.
Microbiology	M.S.	Ph.D.
Mycology	M.S.	
Pathology		Ph.D.
Pharmacology	M.S.	Ph.D.
Physiology	M.S.	Ph.D.
Psychology	M.A.	Ph.D.
Speech Pathology and Audiology	M.A.	

y approved combination of French, Spanish, or Spanish American Literature is available as ctor of Philosophy field.
e School of Public and International Affairs offers a Master of Arts field in International irs.
ology, botany, and zoology

Combined Master of Science and Doctor of Medicine Degrees

Students interested in the combined degrees of Master of Scie
Doctor of Medicine must meet the requirements for admissio
Graduate School of Arts and Sciences and to the Doctor of Medi
gree program of the School of Medicine and Health Sciences.

The Master of Science program consists of a minimum of 30 s
hours of credit and the fulfilling of the tool requirement (see page
A maximum of 12 semester hours of credit for graduate-level cours
pleted as a part of the Doctor of Medicine degree curriculum (
already applied toward the bachelor's degree) will be allowed i
ment of the requirements of the Master of Science degree. The re
18 semester hours of work, which in most programs includes a thes
be work in the basic medical sciences normally required for a M
Science degree in the Graduate School of Arts and Sciences.

Dual Program for the Doctor of Medicine and Doctor of Philosophy Degrees

A dual program is available to qualified students who seek both the
of Medicine and Doctor of Philosophy degrees. The requirements
must be fulfilled for both degrees are identical to those current
separately established in the School of Medicine and Health Scien
the Graduate School of Arts and Sciences.

A student working toward these degrees may apply a maximum
semester hours of approved course work in the School of Medici
Health Sciences toward the minimum of 48 hours of course work r
to qualify for the General or Cumulative Examination for doctoral
dacy. This course work is normally taken during the semesters tha
nate with the medical program and in the years following the aw
the M.D. degree. The student's research for the dissertation may
concurrently with the final 24 semester hours of graduate cours
leading to the General or Cumulative Examination. The estimate
for the completion of this dual program is six years.

In order to enter the dual degree program, a prospective stude
must apply for and gain admission to both the Graduate School of A
Sciences and the School of Medicine and Health Sciences sep
through established procedures. Upon admission to both schools
student may then apply for affiliation with the dual degree program
toward the Doctor of Philosophy degree is performed under the di
tion of a departmental doctoral committee.

REQUIREMENTS FOR THE DEGREES

The Master's Programs

Unless otherwise specified, the requirements listed below are app
to candidates for the degrees of Master of Arts, Master of Arts in
Studies, Master of Fine Arts, Master of Forensic Sciences, Mas
Music, Master of Science, Master of Science for Teachers, Mas
Science in Forensic Science, and Master of Science in Special Stud

1. *General Requirements.*—For a master's degree program *incl*
thesis, the satisfactory completion of a minimum of 30 semester ho

ved graduate work, including six semester hours of thesis research, uired. For a master's degree program which does *not* include a the number of semester hours of approved graduate course work is pined by the department, and normally consists of from 30 to 36 ter hours. The program without the thesis is not an individual stu- option and is not available in every department. Departments can ften do set requirements above the minimum required by the Gradu- hool. The program of study leading to the degree of Master of Arts ecial Studies or Master of Science in Special Studies consists of 36 ter hours of approved graduate course work and does not require a

rk taken to make up deficiencies is never counted as part of the ements leading to a master's degree. Upon approval, up to one-half required graduate work may be taken in courses offered by the affiliated institutions of the Consortium of Universities of the Wash- n Metropolitan Area, Inc., or by another degree-granting division of University. If credit is transferred from another institution (see nsfer of Credit," page 95), the number of semester hours which may ken at an affiliated Consortium institution is reduced by the number urs accepted as transfer credit.

master's degree candidates must complete degree requirements n four years. Extensions beyond this time period require approval written request based on specific and temporary interfering circum- es.

Academic Work Load—Full-time students register for nine to 12 se- er hours each semester; part-time students register for six semester each semester. These requirements do not apply to students who fewer than nine semester hours (full-time) or six semester hours -time) remaining to complete their programs. No more than 15 ster hours may be taken during any one semester.

Transfer of Credit—A maximum of one-quarter of the semester hours aduate course work required for a degree may be approved for trans- the Graduate School from the Division of University Students, an- degree-granting division of this University, or another accredited ge or university. For a transfer of credit to be approved *all* of the wing conditions must be met: the course work must have been taken to admission to the Graduate School, it must be approved as part of tudent's program of studies, it must not have been applied to the pletion of requirements for another degree, it must be post-baccalau- graduate-level course work, it must have been taken within the past years, and the student must have received a grade of *B* or better in course for which a transfer of credit is requested. This action must ade in writing and approved by the departmental advisor and the . A transcript of the course work must be on file before the request be considered.

Tool Requirement--Candidates for the degrees of Master of Arts in ield of art therapy, Master of Arts in Special Studies, Master of Arts e field of speech pathology and audiology (nonthesis option), Master orensic Sciences, Master of Music, Master of Science in anatomic ology, Master of Science in Forensic Sciences, and Master of Science

grade of *B* or better of a course in mathematics, statistics, or c
programming which is approved by the appropriate department an
Graduate School. It is possible to satisfy the latter part of the req
by passing a special examination covering the approved course
administered by the appropriate department, at the level of the fina
nation.

A doctoral student whose native language is not English may n
the native language to meet a foreign language examination requ
However, with the approval of the department, such a student m
to fulfill a language requirement by taking an examination of
and writing proficiency in English, provided significant academic
in the relevant field of study has been published in the student's
language. Arrangements for this English examination should be ma
the English for International Students office.

A doctoral student may omit a tool preparation course at George
ington University if the student has had a similar course at another
or university. However, proficiency in that tool must be validated
examination at this University.

Further details for meeting the various tool requirements are st
the Graduate School's Student Handbook.

5. *The General Examination*—Each student is required to compl
General Examination no later than the semester following the com
of course requirements. The General Examination is composed
written examination five to six hours in length in each of the areas o
comprising the student's total program; the time permitted betwe
examination is determined by the administering department. So
partments permit one or two areas of study to be "written off;" th
special, shorter examination is given after a year of course work
area. A cumulative examination system is in effect in the fields of
istry and physiology, and in the field of psychology a system of tw
prehensive examinations is used. Students in these fields should
the appropriate department for information about its system.

6. *The Degree of Master of Philosophy*—Upon departmental reco
dation, the degree of Master of Philosophy may be awarded to st
who have successfully completed all requirements for the Doc
Philosophy degree up to and including the General Examination.
departments recommend students for this degree.

7. *The Dissertation and Final Examination*—A dissertation is requ
each doctoral candidate as evidence of ability to perform schola
search and interpret its results The candidate normally enrolls fo
sertation Research upon completion of the General Examination; ho
the candidate may register for up to one-half of the required num
semester hours of *Dissertation Research* during the time the Gener
amination is being completed. After the required number of ho
dissertation research has been taken, if more time is needed to co
the dissertation, the student must maintain continuous registratio
page 49) each semester until the dissertation is finished and the Fi
amination is passed. If the dissertation is not completed within five
from the date the General Examination is completed, the student w
required to retake the General Examination.

later than the date specified in the University Calendar, the candidate submit to the Dean the original and one copy of the dissertation and stract for inclusion in the Announcement of the Final Examination or reproduction by University Microfilms, Inc.

en the dissertation has been approved by the director and two mem- of the Doctoral Program Committee and filed wih the Dean, the candi- takes the Final Examination, an oral examination which is open to ublic. A committee of examiners (composed of Graduate School ty and, when appropriate, outside scholars) conducts the examina- If the candidate passes, he or she is recommended by the Graduate ol for the degree of Doctor of Philosophy.

tailed information regarding regulations for the form and reproduction e dissertation is available in the Office of the Dean. The successful idate for the doctorate is required, before receiving the degree, to a fee to cover the expense of printing the Announcement of the Final ination, and for the basic service rendered by University Micro-, Inc.

LOWSHIPS AND FINANCIAL AID

mited number of graduate teaching assistantships and University owships are available in most departments of instruction to students stered in the Graduate School of Arts and Sciences. Other kinds of nsored and University awards are available, but limited.

tudents applying for admission who also wish to apply for a fellow- should submit the fellowship application and the application for ission by February 15; the necessary transcripts, Graduate Record mination scores, and letters of recommendation should also be on file this date. Students currently enrolled in the Graduate School should mit only the fellowship application and have current letters of recom- dation on file by February 15.

orms are available at the Office of the Graduate School of Arts and ences. Filing the fellowship application entitles the student to con- eration for all awards available in the student's department.

tudents who wish to apply for loans should indicate their intent to do on the application for admission. Information concerning loans is con- ed in a booklet, *Student Financial Aid*, available from the University's dent Financial Aid Office.

OPERATIVE PROGRAMS

e American Studies Program at George Washington University is liated with the American Studies Program of the Smithsonian Institu- . This arrangement offers students in the field of American Civiliza- an opportunity to take advantage of the Washington environment. mbers of the staffs of the Smithsonian's American Studies Program, seum of History and Technology, National Portrait Gallery, National lery of Art, and National Gallery of Fine Arts offer seminars and tu- ial instruction in fields which provide students with an unusual op- tunity to develop new dimensions in the discipline of American

Civilization. This program of study is open to students working
the degrees of Master of Arts and Doctor of Philosophy, and is in
to prepare them for research, teaching, and museum-related caree

The Department of Art at George Washington University and the
sonian Institution offer a joint graduate program of study and rese
museum studies leading to the degree of Master of Arts in the
Art History with a concentration in Museum Training. The Depa
has also established a program of study in affiliation with the
Museum, the Corcoran Gallery of Art, and area private art galleri
program in Museum Studies likewise involves the cooperation of
departments with area museums.

A program of study leading to the degree of Doctor of Philoso
American Civilization with emphasis on library research and collec
offered jointly by George Washington University and the Library
gress. The coordinator of the Library Program and the staff offer an
tation seminar and other courses and supervise students in readi
research and in work on such library problems as indexing, catal
and bibliography.

For further information concerning these programs contact one
following offices at George Washington University: the Graduate
of Arts and Sciences for those who are interested in any of the field
above, the Department of Art for those interested in museum traini
American Studies Program for those interested in the American
tion field.

George Washington University, in cooperation with three other r
universities and the Folger Shakespeare Library, has established the
Institute for Renaissance and 18th Century Studies as a cooperati
ture in graduate studies in the humanities. Seminars (limited to 12 st
each) are offered each semester under the direction of outstanding
can and foreign scholars. The Folger Library is the physical cen
the Institute. All participants enrolled in the seminars are granted
to the collections of rare books, manuscripts, and reference mate
the Library. There are also opportunities for participants to es
personal relationships with the fellows and readers at the Library
furtherance of their research. All registered students are eligible t
for admission to one or more of the seminars, although priority in
ment will be accorded to graduate students working on dissertatio
to postdoctoral scholars from the sponsoring institutions.

Further information, including a listing of seminar topics, is av
in the Office of the Graduate School of Arts and Sciences or at the
Shakespeare Library.

The University and the National Bureau of Standards have entere
a cooperative agreement to further educational opportunity at bo
University and the Bureau. This arrangement holds great promi
graduate study and research, particularly in the physical sciences.

SPECIAL OFF-CAMPUS DEGREE PROGRAMS

The Graduate School of Arts and Sciences is currently offering th
lowing special degree programs off campus: (1) the degree of Ma

in Special Studies with areas of concentration in Criminal Justice, lative Affairs, Social Policy, or Urban Learning and (2) the degree aster of Science in Special Studies with area of concentration in Tele- nunication Operations, Environmental Science, and Social and Eco- c Statistics.

e Graduate School has academic jurisdiction over these off-campus rams which are administered by the College of General Studies. Not f these programs may be available in any given year. For details ult the Graduate School of Arts and Sciences.

HOOL OF EDUCATION

n R. Tillman
stant Dean R.E. Baker
cutive Assistant to the Dean L.H. Kornhauser

CULTY*

fessors J.G. Allee, Jr., R.E. Baker, J.G. Boswell, P. Botwin, J.L. Breen, . Brenner, M.E. Coleman, R.S. Cottrell, Jr., L.H. Elliott, R.J. Frankie, . Hawkins, R.K. Ives, S. Kavruck *(Visiting)*, A. Marinaccio, M. Mc- tyre, L. Nadler, M.N. Rashid, C.R. St. Cyr, D. Sinick, L.M. Stallings, . Tillman, C.E. Vontress

ociate Professors M. Burns, A.L. Dickerson *(Research)*, J.W. Fleck, L.H. eorge, G.L. Horrworth, E.P. Kulawiec, D. Linkowski, D.A. Moore, S.R. arafore, R.I. Peterson, J.R. Shotel, C.W. Smith, J.E. Snodgrass, G.D. Viggs, L. Winkler, M.R. Withers

unct Associate Professor D.C. Paup

istant Professors M.S. Castleberry, J.A. Greenberg, J.C. Heddesheimer, .D. Johnson, S.J. Little, G.A. Lofaro *(Research)*, H. Nashman, C. Reeder *Research)*, N. Tiscione, L.A. Tsantis, N.J.S. Sobel

ructors M. Gazvoda *(Research)*, S.A.R. Hoth *(Research)*, J.S. Landy, .C. Park *(Research)*

nbers of the Advanced Graduate Faculty

Baker, J.G. Boswell, P. Botwin, J.L. Breen, M. Brenner, W.T. Carroll, . Castleberry, R.S. Cottrell, Jr., L.H. Elliott, R.J. Frankie, J.A. Green-

* President of the University, the Vice President for Academic Affairs, the Registrar of the ersity, the Director of Admissions of the University, and the University Librarian are ex o members of the Faculty of the School of Education.

berg, D. Hawkins, J.C. Heddesheimer, G. Horrworth, R.K. Ives, E.P. wiec, D. Linkowski, A. Marinaccio, D.A. Moore, L. Nadler, S.R. Par R.I. Peterson, M.N. Rashid, C. Reeder, C.R. St. Cyr, J.R. Shotel, D. S G.W. Smith, J.E. Snodgrass, L.M. Stallings, R. Tillman, L.A. Tsantis, Vontress, G.D. Wiggs, L. Winkler

Committees*

THE DEAN'S COUNCIL†
1976: R.K. Ives, J.C. Heddesheimer
1977: D.A. Moore, J.R. Shotel
1978: D.C. Paup, L.A. Tsantis

COMMITTEE ON ADMISSION AND ADVANCED STANDING‡
R. Tillman *(Chairman)*, P. Botwin, J.L. Breen, D. Linkowski, J.Y. Ruth

COMMITTEE ON SCHOLARSHIP
R. Tillman *(Chairman)*, P. Botwin, J.L. Breen, D. Linkowski

INTRODUCTION

The University began offering professional courses for teachers in 190 and in 1907 it established a Division of Education. In 1909 the Divisio Education became the Teachers College which in its early years was cerned largely with teacher preparation on the undergraduate level.

In 1928 the Teachers College became the School of Education greater provision was made for advanced study. Since that time the gr ate enrollment has steadily increased, with the result that today School has a considerably larger number of graduate than undergrad students.

The School of Education prepares teachers, resource and support sonnel, and administrators for educational service. The School also o opportunities to experienced teachers to extend and enrich their educa The programs are designed to meet the broad needs of all persons seek the knowledge and skills necessary to provide for effective lear and teaching. The School's programs focus on the needs of person terested in the traditional elementary and secondary school environm but also include the preparation of individuals for all areas of educ covering the life span from pre-school through the adult years in both public and private sectors of society. The following graduate prog are representative: Generic Counseling, Adult Education, Human Reso Development, Rehabilitation Counseling, College Student Develop Higher Education, Dance, Urban Recreation and Parks, Tourism, E **Childhood Education and Early Childhood Special Education.**

A Bachelor of Arts in Education is more than preparation for teac in schools. The degree provides background and experiences for em

* The dean and the assistant dean of the School of Education are ex officio members committees.
† Elected by the Faculty in the year designated to a three-year term
‡ Appointed by the dean.

t in a variety of public and private settings. A majority of the credit rs of required courses are in the liberal arts. In addition, the programs vide opportunities for students to develop critical thinking and reason- as well as leadership, organizational and planning skills. Emphasis is ed upon developing the human relationship qualities that are essential ields that require involvement with people in all age ranges and from walks of life.

he School of Education is the administrative unit for three depart- nts: Education, Human Kinetics and Leisure Studies, and Special Edu- ion. In addition to programs of study leading to its degrees, the School ers credit and non-credit workshops designed specifically to meet the que needs of metropolitan area school systems, and other clients in vate industry and in government.

Special curricula are tailored on an individual basis for liberal arts duates and graduates of other professional schools who are interested teaching. The School also offers a wide range of courses for teachers o wish to renew licenses and for provisional teachers who wish to epare for teaching certificates.

Laboratory and clinical facilities are provided by the University Reading nter and the Speech and Hearing Clinic. Field experiences are provided cooperation with public and private schools, social agencies, museums, stitutions in the business community, and community and junior colleges. The schedule of courses is arranged to meet the convenience of both ll-time and part-time students.

ofessional Courses for Non-Education Majors

udents in Columbian College, both those who have declared a major d those who are undecided, may take up to 12 semester hours of pro- ssional courses such as Education, and include them in the hours of edit required for the Bachelor's degrees in Columbian College. Students ecting professional courses under this rule must obtain the approval of e dean of Columbian College before registration.

The School of Education is in the process of making dramatic changes its total curriculum. A major change will be to offer freshmen and ophomores a professional education course in each semester that will clude field work experiences. These courses will make it possible for tudents who are undecided about the choice of a career to have an op- ortunity to test teaching and the many related helping services areas.

ducation for Teaching

rograms of study in education for teaching are based upon the assump- ion that every teacher should have a broad general education, mastery f the content of instruction, and professional competencies.

The relative emphasis placed upon each of these aspects of the total ducation for teaching varies in accordance with the purposes of each rogram. For instance, since elementary school teachers teach all subjects, hey require content preparation of greater breadth and less specialization han secondary school teachers.

It is the view of the School of Education that an acceptable minimum education for teaching requires four years of full-time study or the equiva-

lent in part-time study. For superior preparation teachers are urged to for five years of full-time study or the equivalent in part-time study.

The student may choose any one of the following plans to ac superior educational preparation for teaching:

1. Upon receiving the bachelor's degree in education, he or she take a teaching position and, after acquiring some professiona perience, return to the School for graduate study leading t master's degree. This plan enables students with bachelor's de to begin their teaching careers, and to use their work experien enhance graduate study which will follow.
2. The student may choose to pursue full-time graduate study le to the master's degree immediately after receiving the bach degree.
3. A student whose bachelor's degree is in one of the liberal arts ciplines may choose to complete the requirements for certific for teaching by studying in one of the teaching fields in a pro custom-tailored to his or her particular needs.

REGULATIONS

University regulations concerning admission, registration, fees, finances are stated on pages 20–33; other University regulations, on 44–53.

General Scholarship Requirements For Undergraduates

Regulations regarding academic standing, probation, suspension, drawals, classification of students, required placement examinations waiving introductory courses by examination appear on pages 70–7 and 76 of this *Bulletin*.

*ACADEMIC WORK LOAD

Fifteen to 17 semester hours of credit constitute a normal progra student with a quality-point index of 3.00 or higher may, with the mission of the dean, enroll for 18 or 19 hours. No student may enro more than 19, except by permission of the Committee on Scholarsh

A student employed 15 hours or less a week may carry a normal gram of college work.

A student employed from 16 to 25 hours a week may enroll for 13 hours. Such a student with a quality-point index of 3.00 or higher with special permission of the dean,† enroll for 15 or 16 hours.

A student employed from 26 to 34 hours a week may enroll for 9 hours. Such a student with a quality-point index of 3.00 or higher with special permission of the dean,† enroll for 12 or 13 hours.

A student employed 35 hours or more a week may enroll for 6 hours. Such a student with a quality-point index of 3.00 or higher with special permission of the dean,† enroll for 9 or 10 hours.

* Academic work load guidelines apply to graduate and undergraduate students.
† Request forms are available at the office of the dean. They should be filled out and r to the office of the dean at least two weeks prior to registration.

student who increases his hours of employment after registration or ny time during a semester must report immediately to the dean so his program may be adjusted, if necessary.
raduate students employed full-time may take a maximum of 6 se-ter hours, unless special permission to take more is granted by the n.*

UIRED PLACEMENT EXAMINATIONS

nglish—Students whose College Board English Composition Achieve-nt Test scores suggest that they will benefit from more intensive ning in compositional skills may be assigned to English 9 or may be ed in vocabulary, spelling, grammar, standard usage, and writing skill ore placement in either Engl 9 or 10.
oreign Languages—A student who has not been granted advanced nding and who wishes to continue in college the language begun in h school must take a placement examination in one of the following: inese, French, German, Greek, Hebrew, Italian, Latin, Russian, or anish. Upon completion of the examination, assignment is made to the propriate course.
Mathematics—New students accepted for registration in Math 30 are uired, prior to registration, to take a placement examination in algebra d trigonometry; those accepted for registration in Math 51 are re-ired, prior to registration, to take a placement examination in algebra. ee specific six semester hours mathematics requirements listed under ementary or secondary education majors.)

RNING CREDIT BY EXAMINATION

ndergraduate students may earn semester-hour credits up to a maximum 30 hours by performing satisfactorily on College-Level Examination ogram (CLEP) Tests or special departmental examinations provided by e departments of Columbian College of Arts and Sciences on an indi-dual basis. *Passing a waiver examination does not entitle the student to ny semester hours of credit.*
College-Level Examination Program (CLEP)—CLEP offers two types of xaminations:
1. CLEP Subject Examinations are offered in a number of subject areas. hese tests measure achievement equivalent to specific college-level ourses. Credit may be assigned for any CLEP Subject Examinations assed at the level recommended in the College Board model policy. redit may not be earned by passing the examination after having taken ne equivalent course.)
2. CLEP General Examinations are offered in five areas: mathematics, ocial sciences, humanities, the natural sciences, and English composition. redit—advanced standing—is not given for the General Test in English omposition.)
Credit will be noted on official transcripts of the George Washington

*Request forms are available at the office of the dean. They should be filled out and returned the office of the dean at least two weeks prior to registration.

University for students who achieve scores above the 50th percentile lege sophomore norms) on CLEP General Examinations with the exce of the English Composition Examination. Further information can be f on pages 22–23 and in the CLEP Registration Guide which may b tained from the Educational Testing Service, One Dupont Circle, Washington, D. C. 20036.

Students interested in becoming certified to teach who have e bachelor's or graduate degrees in fields other than education may s some certification requirements by taking the CLEP Examinations o cial departmental examinations.

See page 76 for additional information on special examinations o by departments.

THE BACHELOR'S DEGREES

The School of Education offers undergraduates programs leading t degrees of Bachelor of Arts in Education and Bachelor of Scien Human Kinetics and Leisure Studies.

Bachelor of Arts in Education

The programs leading to the degree of Bachelor of Arts in Educatio planned to provide (1) general educational backgrounds, (2) funct command of concepts and skills in one or more teaching fields, (3) ma of basic professional information and skills adequate for the begin teacher, and (4) development of attitudes needed for success in teac

The general educational backgrounds needed by prospective tea are obtained through college courses, work experience, leadership a ties, and off-campus cultural opportunities.

As part of formal course work, and on their own initiative, studen the School of Education are expected to take full advantage of the opportunities in the Washington area for developing leadership Advisors are available to help students plan these experiences.

Persons preparing for teaching or for work in other allied ser fields require a well-rounded education. In this connection, a stu completing a 126 semester hour program in elementary education at University will complete approximately 90 credit hours in the liberal a major in secondary education will complete approximately 105 c hours in the liberal arts. Liberal arts courses and selected profess education courses may be completed at George Washington University may be accepted for advanced standing from another accredited institu in accordance with regulations on pages 22–23.

General Information for Freshmen and Sophomores

All undergraduates admitted directly to the School of Education are signed academic advisors at the time of admission. Advisors are desig to provide continuity of advising for students throughout their ye undergraduate study. The program for each student must be approve a faculty advisor.

Since each student's program is defined by individual needs, important that students have a clear concept of their major interes

cation, and that they be familiar with the certification requirements those localities in which they expect to teach. Information on state nsing requirements is available in the Career Services Office, located Woodhull House, 2033 G St., N.W.

rance Requirements for Freshmen and Sophomores

od character and an academic background appropriate for the program studies contemplated are required.

Requirements for admission to the freshman and/or sophomore years as follows:

. An acceptable certificate of graduation from an accredited secondary ool, showing at least fifteen units* which must include four years of glish; at least two years of one foreign language; two years of science, eferably with laboratory instruction; two years of social studies, one which must be American history; and two years of college preparatory thematics.

2. The principal's statement that the applicant is prepared to undertake llege work.

3. College Entrance Examination Board scores submitted on the Scho-tic Aptitude Test and the English Composition Achievement Test. It is recommended that the examinations be taken in December or uary of the senior year. Scores on tests taken in the junior year may submitted. Arrangements for tests are the responsibility of the appli-nt and should be made with the Educational Testing Service, 20 Nassau ., Princeton, N.J. 08540; or 1947 Center St., Berkeley, Cal. 94704, t less than one month before the date of the test. In applying for the st, the applicant should specify that the scores be sent to the Office of dmissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, e American College Testing battery scores will be accepted. The appli-nt should request that these scores be sent to the Office of Admissions rectly from the American College Testing Program, Iowa City, Iowa. It recommended that the applicant take the tests in October of the senior ear.

The School of Education will consider the adequacy of the qualifications an applicant who, because of unusual circumstances, does not present l of the formal requirements stated above. The School may require ap-opriate scholastic-aptitude tests.

International students may be considered for admission with an equiva-nt foreign secondary certificate. A student presenting such a certificate ust also show competence in the English language and may be required enroll in a full-time program in English for Foreign Students before eginning studies in a degree program. Requirements will be determined n the basis of an English Proficiency Test administered on-campus. A andidate who submits a score of 580 or above on the Test of English s a Foreign Language may be excused from taking further course work n English as a foreign language.

Students who have been out of secondary school for three years or

*A unit represents a year's study in a secondary school subject, including in the aggregate not ess than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

more and/or do not meet the above requirements may take a specia
tery of admission tests* by contacting the Office of Admissions or
be considered for admission to the School of Education on a condit
basis. To be admitted into the School's degree program, a conditio
admitted student must complete a trial program of 15 semester hou
course work with a quality-point index of 2.25 or higher. This trial
gram must include one professional course and additional courses sel
from the first-year curricula of the undergraduate degree progra
Education.

The selection of courses to be taken in the trial program must be
in conference with a faculty advisor in the School of Education. A
ference concerning plans for study as a degree candidate is requir
each applicant at the beginning and end of the trial program. Upon
cessful completion of the trial program, the student who has submitt
application for degree candidacy should ask the Admissions Office
consider his application.

Admission with Advanced Standing

Requirements for admission of students transferring from other regio
accredited colleges and universities, and from other divisions of
University, are as follows:

Students who have accumulated 15 hours or more of academic c
at another regionally accredited college or university with an accep
program and acceptable grades may be admitted to the School of Ed
tion. Advanced standing may be awarded for properly certified co
taken at regionally accredited colleges or universities for which the
dent received a grade of C or better, and may be applied toward a d
provided that such courses are comparable to the curricular require
of the degree at GW.

Although a grade of D is not acceptable for transfer, the course ma
used to satisfy a curricular requirement. Credits earned with a *D* g
may not, however, be counted toward advanced standing.

The School reserves the right to refuse credit for transfer in w
or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript
directly from each institution formerly attended to the Office of Ad
sions, George Washington University, Washington, D.C. 20052.

Students may transfer from another division of this University
a degree program in the School of Education. The student must presen
accumulated quality-point index of 2.00 or higher at the time of trans
A student wishing to transfer into the School from another division of
University must submit a formal application of transfer and meet
requirements for acceptance to the School.

Courses taken at another division of this University may be appl
toward a degree in this School provided they are comparable to the
ricular requirements of the degree.

Students applying for transfer from another accredited college
university or from another division of this University whose previ

* These tests include, among others, the Differential Aptitude Test, Cooperative English Ex
nation and Ohio Psychological Test.

cademic records raise doubts of their ability to complete degree require-ments successfully may be admitted to the School of Education on a con-litional basis. To be admitted into the School's degree program, a condi-ionally admitted student must complete a prescribed trial program of .5 semester hours of course work with a quality-point index of 2.25 or ıigher. A student registered in another division of this University who has ın accumulated quality-point index of less than 2.00 and who is condi-ionally admitted to this School must earn a 2.25 quality-point index in he trial program and must during this trial program bring the accumulated quality-point index to 2.00 or higher to be admitted to the School's degree program.

The selection of courses to be taken in the trial program must be made n conference with a faculty advisor in the School of Education. A con-ference concerning plans for study as a degree candidate is required of each applicant at the beginning and end of the trial program. Upon success-ful completion of the trial program, the student who has submitted a degree-candidate application will be advanced to degree status.

Requirements for the Degrees

To be recommended for a degree a student must satisfy the admission, residence, scholarship, and curriculum requirements. The Bachelor of Arts degree requires 126 semester hours; the Bachelor of Science requires 124 semester hours.

RESIDENCE

Candidates for the bachelor's degree must complete satisfactorily while in the School of Education a minimum of 30 semester hours.

DEAN'S LIST

To be eligible for the Dean's List a full-time student must obtain a quality-point index of 3.5 on courses completed during the past semester. A part-time student, to be eligible, must obtain a quality-point index of 3.5 on the last 12 semester hours of coursework. Such part-time students must have been enrolled for at least one three-hour course each semester, and resi-dence during the period involved must be continuous.

SCHOLARSHIP REQUIREMENTS

For the system of grading and of computing scholarship, see pages 45–46.

In order to graduate, a student must have a quality-point index of at least 2.25. A quality-point index of at least 2.25 is required before per-mission is granted to do student teaching in the senior year.

Probation—A student who fails to maintain a quality-point index of at least 2.25 is placed on probation. The student remains on probation as long as the index is below 2.25, or until probation is removed by the Committee on Scholarship.

Suspension—A student on probation who fails to raise the index to 2.25 within the time specified may be suspended.

A student suspended for poor scholarship may, within 10 days, appe the case to the Committee on Scholarship through the dean. If the ca appears to be remediable and the student's scholarship seems likely improve, the Committee may readmit the student on probation. A stude denied readmission may again, after a lapse of a calendar year, petition t Committee through the dean for readmission. A student suspended twi will not be readmitted.

CURRICULUM REQUIREMENTS

In all bachelor's curricula at least 30 semester hours must consist courses numbered above 100.

CREDIT/NO CREDIT OPTION

A junior or senior student who has a cumulative quality-point index 2.50 or better, may, with the approval of an advisor and the dean, ta one course a semester and receive a grade of *CR* (Credit) or *NC* (No Cred which will be recorded on the student's transcript but will not be reflecte in the student's quality-point index. No student will be allowed to ta more than four credit no credit courses. Students must sign up for su an option at registration. Under no circumstances may students chan from credit no credit status to graded status, or vice versa, after the en of registration. Courses required in the student's major field may n be taken on the credit no credit basis. A transfer student may not choos this option until the second semester of enrollment at this University.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authoriz Withdrawal) may be assigned are described on page 46.

Removing an Incomplete—Although the grade of *I may* remain on t records for a maximum of one year, the instructor should normally se much briefer period within which the uncompleted work (usually the fin examination or a required paper) must be made up. The grade of *I* cann be removed by reregistering for the course here, or by taking its equiv lent elsewhere. An "Incomplete" cannot be made up after the lapse one calendar year except by written permission of the Dean's Council. A "Incomplete" which is not removed within one calendar year is aut matically changed to an *F*.

National Teacher Examinations

All candidates for the degree of Bachelor of Arts in Education are require to take the National Teacher Examinations. Students receive individu reports of test scores and may avail themselves of the regular transcri services of the Educational Testing Service. Students must request th Testing Service to send copies of test scores to the School of Educatio

Students required to take the Examinations must register for them wi the Educational Testing Service. Application forms are available in th Office of the Dean.

Teaching-Field Programs

SUBJECT-AREA SPECIALIZATION

Subject-area specialization depends upon the teaching position for which the student is preparing. Those planning to teach in elementary schools need a degree of competency in several fields. Those preparing to teach in middle schools must acquire competency in a chosen interdisciplinary subject-matter specialization. Those preparing to teach in junior or senior high schools must demonstrate competence in a major teaching field. A minor teaching field is optional, but recommended. The student should begin teaching-field preparation during the first two years.

Teaching-field requirements, developed in cooperation with appropriate departments of the University, include satisfactory completion of prescribed academic courses in one or more fields, a satisfactory score on the special field examination of the National Teacher Examinations* and satisfactory completion of the prescribed special methods courses.

Prescribed academic courses vary in number in accordance with the scope and complexity of the teaching field and the licensing requirements of the various states.

Professional Education

The basic professional information, skills, and attitudes needed by beginning teachers are provided through a sequence of courses to be taken in the junior and senior years. Lectures and class discussions are closely coordinated with field work. Instruction is differentiated to meet the needs of those preparing to teach on the various levels—elementary school, middle school, junior high school, senior high school and adult.

The prescribed courses in special methods are concerned primarily with methods of initiating, guiding, and evaluating learning experiences dealing with the content of teaching fields. They attempt to bring to the student specific suggestions drawn from the accumulated experience of successful teachers. In addition, the courses review the teaching-field content currently in use in schools.

Education Curriculum

The following is the program for the first two years in preparation for the Bachelor of Arts in Education degree in the School of Education.

		Semester Hours
English:	Composition—Engl 9 or 10, 11 or 12	6
	Literature—Engl 51–52, 71–72, or 191–92	6
Mathematics:	Math 9 and 10 (for elementary education majors) and two semesters chosen from Math 3, 6, 9 or 10 (for secondary education majors)	6

* Special field examinations of the National Teacher Examinations are available in elementary education; early childhood education; biology and general science; English language and literature; industrial arts; mathematics; chemistry, physics and general science; social studies physical education, business education, music education, home economics and art; education.

Students preparing to teach history or geography take the special field examination in social studies.

Students preparing to teach in fields in which special field examinations are not available must obtain a satisfactory score on a special field examination given by the instructor in the special methods course involved.

Human Kinetics and Leisure Studies:	Any combination of first-group courses in the Department of Human Kinetics and Leisure Studies	
Education:	Educ 101, 104	
	Educ 102 (for elementary majors) or 103 (for secondary majors)	
Science:	Three semesters (2 in biological science and one in physical science or vice versa) for elementary education majors and two semesters for secondary education majors. Courses are to be chosen from BiSc 3 4 or 11 12; Chem 3 4 or 11 12; Geol 1 2; or Phys 1 and 2, or 9–10	
Social Studies:	Hist 71–72 for elementary education majors and Hist 71–72 or PSc 4 and 6 or 5 and 6 for secondary majors	
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40; Hist 71–72; PSc 1 and 2; PSc 2 and 3; or Soc 1 and 2	
Speech and Drama:	SpDr 1 or 11	
Electives:		
	Total	60–

Human Kinetics and Leisure Studies Curriculum

The following is the program for the first two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree with Specialization in Elementary/Secondary Human Kinetics and Leisure Studies in the School of Education:

		Semester Hours
English:	Engl 9 or 10, 11	6
Human Kinetics and Leisure Studies:	Four semester hours selected from first-group HKLS courses: 59, 60, 61, 62 recommended	4
Education:	Educ 104	3
	Educ 102 (for elementary specialization) or 103 (for secondary specialization)	3
Mathematics/ Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9 and 10; or Phys 1 and 2, or 9–10	6
Social Studies:	Hist 71–72, or PSc 1 and 2 or 2 and 3	6
	Six semester hours selected from one of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40; Hist 71–72; PSc 1 and 2; PSc 2 and 3; or Soc 1 and 2	6
Speech and Drama:	SpDr 1 (or 11 if recommended by the department)	3
Electives:		30
	Total	60

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree with a specialization in dance education:

		Semester Hours
English:	Engl 9 or 10, 11	6
Human Kinetics and Leisure Studies:	HKLS 107, 108*, 157	7
	Any combination of HKLS courses numbered 10–57 and/or 121* and/or 123*	8
Education:	Educ 103, 104	6
Psychology:	Psyc 22, 112	6
Mathematics/ Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9 and 10; Phys 1 and 2, or 9–10	6
Social Studies:	Hist 71–72 or PSc 1 and 2	6
	AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40; PSc 1 and 2; or Soc 1 and 2	6
Speech and Drama:	SpDr 1 or 11	3
Electives:		16
	Total	64

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree program in dance for students not interested in certification for teaching:

		Semester Hours
English:	Engl 9 or 10, 11	6
Human Kinetics and Leisure Studies:	HKLS 150, 157	6
	Any combination of HKLS courses numbered 10–57 and/or 121* and/or 123*	6
†Humanities:	Art 21–22, 31–32; Mus 1, 3, or 4; Phil 50; SpDr 45	6
†Mathematics/ Sciences:	BiSc 3–4; Chem 3–4; Geol 1–2, 5; Math 3, 6, 9, 10; Phys 3 and 4 or 9–10	6
†Psychology/ Social Studies:	AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51, 52; Hist 39–40, 71–72; PSc 1 or 3 and 2; Psyc 1, 5–6, 8, 22, 29; Soc 1 and 2	6
Electives:		24
	Total	60

The teaching-field programs and their requirements are as follows:

Elementary Education Program

GENERAL EDUCATION REQUIREMENTS (See pages 73-74.)

SUBJECT-AREA SPECIALIZATION: 42-45 credit hours

* May be repeated for credit.
† Semester hour requirements may be satisfied by approved advanced courses if the student is qualified and receives the instructor's permission to take the course.

PROFESSIONAL COURSES

Educ 108:	Human Development, Learning, and Teaching	3
Educ 110:	Elementary School Teaching of Reading	3
Educ 111:	Elementary School Curriculum and Methods	15
Educ 112:	Educational Measurement	3
Educ 105:	Society and the School	3
*Educ 135:	Student Teaching in Elementary Schools	9
	Total	36

Students majoring in elementary education may prepare for an additional area of certification by substituting for elective courses a special sequence of courses in early childhood education or special education.

AREA OF CERTIFICATION IN EARLY CHILDHOOD EDUCATION: 18 credit hours

AREA OF CERTIFICATION IN SPECIAL EDUCATION: 24 credit hours

Middle School Education Program

The middle school education program offers four teaching-field specializations together with appropriate professional training. While the importance of a thorough understanding of the nature of the middle school learner and the middle school is emphasized, equal stress is placed on early and continued direct experiences in the middle school. This experience culminates in a senior-year block instructional program conducted largely in the field.

GENERAL EDUCATION REQUIREMENTS:

63 credit hours (See pages 73–74.)

SUBJECT AREA SPECIALIZATIONS

Communications: 30 credit hours
Life Science: 30 credit hours
Earth/Space Science: 30 credit hours
Social Science: 30 credit hours

PROFESSIONAL COURSES

Educ 105:	Society and the School	3
Educ 108:	Human Development, Learning and Teaching	3
Educ 110:	Elementary School Teaching of Reading	3
Educ 112:	Educational Measurement	3
Educ 134:	Student Teaching in Secondary Schools	6
Educ:	A second reading course and two middle school education courses to be announced	12

* Educ 135 is reduced to six credit hours when certification areas in early childhood education or special education are taken. This allows for six credit hours of student teaching in either certification area.

Special Methods:	Three semester hours to be selected from the following courses	3
Educ 136:	Teaching English in Secondary Schools	
Educ 137:	Teaching Speech	
Educ 138:	Teaching Social Studies in Secondary Schools	
Educ 144:	Teaching Science in Secondary Schools	
	Total	27

Secondary Education Programs

In the secondary education program a number of teaching-field specializations are offered. However, it is strongly recommended that, wherever possible, a candidate undertake the equivalent of a minor in an interdisciplinary subject area. Early counseling by the program advisor is urged to ensure a balanced and realistic program of study. The requirements in the secondary education program are as follows:

GENERAL EDUCATION REQUIREMENTS (See pages 73-74.)

SUBJECT AREA SPECIALIZATIONS

Art: 39 credit hours
Biology: 46 credit hours
Chemistry: 40-44 credit hours
Earth Science: 46-49 credit hours
English: 39 credit hours
French: 45 credit hours
General Science: 41-47 credit hours
Geography: 24 credit hours
German: 32 credit hours
History: 42 credit hours
Mathematics: 39 credit hours
Music: 42 credit hours
Physics: 36 credit hours
Russian: 36 credit hours
Social Studies: 42 credit hours
Spanish: 42 credit hours
Speech and Drama: 36 credit hours

PROFESSIONAL COURSES*

		Semester Hours
Educ 105:	Society and the School	3
Educ 108:	Human Development, Learning, and Teaching	3
Educ 112:	Educational Measurement	3
Educ 131:	Secondary School Principles and Methods	3
Educ 134:	Student Teaching in Secondary Schools	6–9
Special Methods:	Three to six semester hours from the following courses	3–6
Educ 136:	Teaching English in Secondary Schools	
Educ 137:	Teaching Speech	

* A course in the teaching of reading is recommended since it is required for employment in many jurisdictions.

Educ 138:	Teaching Social Studies in Secondary Schools
Educ 139:	Teaching Art in Secondary Schools
Educ 140:	Teaching Mathematics in Secondary Schools
Educ 144:	Teaching Science in Secondary Schools
Educ 146:	Teaching Foreign Languages
	Total 21–27

Bachelor of Science in Human Kinetics and Leisure Studies

The program, which is designed to prepare students for teaching in elementary and secondary schools, offers opportunities for specialization in dance education and elementary or secondary school physical education. The Department also offers a program in dance for persons not interested in certification for teaching.

Prerequisite—For the first two years of the Bachelor of Science in Human Kinetics and Leisure Studies curriculums, see pages 112–13.

Specialization in Dance Education, junior and senior years—Educ 105, 108, and 112; HKLS 109-10, 117, 119, 133, 135-36, 141-42, 144, 150, 151, 164, 175; nine hours of electives. Total: 60 credit hours.

Specialization in Dance for students not interested in certification for teaching, junior and senior years—HKLS 10-58, 121, 123 (10 credit hours selected from the above); HKLS 108, 109-10, 120, 135-36, 137, 141-42, 144, 173, 175; 27 hours of electives. Total: 64 credit hours.

Specialization in Elementary/Secondary Human Kinetics and Leisure Studies, junior year—Educ 108; HKLS 103, 111-12, 114, 130, 150, 151, 158; three hours of an elective. Total: 30 credit hours. *Senior year:* Educ 105, 112; HKLS 113, 129, 133, 138, 164, 171; one to seven hours of electives. Total: 34 credit hours.

Teaching Emphases for Majors in Education and Human Kinetics and Leisure Studies

The faculty of the School of Education of George Washington University feels very keenly its responsibility to offer courses and programs that are educationally sound and enriching. A realistically planned program should also enhance opportunities for graduates to obtain teaching positions throughout the United States. To this end the faculty has developed special teaching emphases—courses which students will be encouraged to select to satisfy elective hours in their programs.

Teaching emphases will be offered in the following areas:

Counseling
International Education
Movement Education
Reading
Speech Pathology and Audiology
Tourism

Most teaching emphases are designed to focus on areas of recognized need for elementary and secondary pupils throughout the Nation, particularly those in the large urban centers of America. Graduates of our teacher preparation programs with their added knowledge, skills, and understandings in these critical areas should be highly attractive candidates for positions as they talk with prospective employers.

A field that has experienced significant growth, both nationally and internationally, is tourism. The academic advisor in tourism will try

to assist students who select this sequence to find part-time work in travel agencies and bureaus to enhance classroom experience.

Many of the courses offered in the teaching emphases have been taken directly from master's degree programs of the School and assigned undergraduate numbers.

Students interested in more detailed information about these sequences are encouraged to contact the Dean's Office, School of Education.

The following represents a breakdown of the specific courses offered in each of the teaching emphases:

		Semester Hours
Guidance and Counseling		
Educ 161:	Human Development	3
Educ 162:	Foundations of Counseling	3
Educ 163:	Personal and Social Adjustment	3
International Education		
Educ 171:	Seminar: International Education	3
Educ 172:	Seminar: International Education	3
Educ 173:	Comparative Education	3
Movement Education		
HKLS 101:	Physical Education in the Elementary School	3
HKLS 102:	Movement Education	3
HKLS 129:	Introduction to Motor Learning	3
HKLS 130:	Motor Performance in Childhood	3
Elective:		
HKLS 113:	Field Experience: Practicum in Physical Education, Dance, or Leisure	3
Reading		
Educ 100:	Special Workshop in Education: Field Experience in Reading with Emphasis on Mainstreaming	3
Educ 110:	Elementary School Teaching of Reading	3
Educ 111:	Elementary School Curriculum and Methods (Diagnostic Reading)	3
Speech Pathology and Audiology		
SpDr 1:	Communicative Speaking and Listening	3
SpDr 101:	Bioacoustics	3
SpDr 103:	Biophonetics	3
SpDr 104:	Introduction to Speech Pathology	3
SpDr 106:	Introduction to Audiology	3
SpDr 118:	Structural Analysis of Speech and Language	3
SpDr 119:	Clinical Procedures for Communication Disorders	3
Psyc 115:	Psychology of Language and Communication	3
Tourism		
HKLS 104:	Introduction to Travel and Tourism	3
HKLS 113:	Practicum in Physical Education, Dance, or Leisure	3
HKLS 184:	Workshop—ICTA (Institute of Certified Travel Agents)	3

GRADUATE STUDY

The School of Education offers graduate programs leading to the degrees o Master of Arts in Teaching, Master of Arts in Education, Educatio Specialist, and Doctor of Education.

GRADES

For graduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Min mum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; *CR*, Credi Grades *A*, *B*, *C*, and *F* are counted in computing the quality-point inde (see page 46).

Whenever a grade has not been assigned, the symbol *I* (Incomplete) o the symbol *W* (Authorized Withdrawal) will be recorded. The symbol indicates that a satisfactory explanation has been given to the instructo for the student's failure to complete the required work of the course. A "Incomplete" cannot be made up after the lapse of one calendar yea except by written permission of the Dean's Council. An "Incomplete which is not removed within one calendar year is automatically change to an *F*. An "Incomplete" cannot be removed by reregistering for th course.

THE DEGREE OF MASTER OF ARTS IN TEACHING

The School of Education offers an intensive, interdisciplinary fifth yea in museum education. This program is designed to prepare selected libera arts graduates, postgraduates, and professionals for education work in a museum or for liaison work between museums and school systems. Stu dents receive the degree of Master of Arts in Teaching upon completio of the program.

For details write the chairman of the Department of Education, M.A.T Program, School of Education, George Washington University, Washin ton, D.C. 20052.

ADMISSION

To be admitted to the program in museum education an applicant must (1) have a bachelor's degree from an accredited institution; (2) submit three written references attesting to quality of academic record and work ex perience; and (3) be interviewed by the University Selection Committee or make alternative arrangements specified by the Committee and approved by the dean of the School of Education. Considered essential are skills in communication, a desire to study and learn from the artifacts of nature and civilization, and an ability for and interest in working with people. Evidence of strong undergraduate, graduate, or professional experience in such fields as American history, geology, art, or the social sciences will be considered favorably.

PLAN OF STUDY FOR THE MUSEUM EDUCATION PROGRAM

The program begins with a six-week summer session. Emphasis is on the study of museums and communication skills. During the fall semester students study the school as an institution—its organization, pupil population, staff and services—and as a laboratory, where they will work in classrooms with students and teachers. The program will also focus on other museum audiences. Students will earn at least 12 semester hours of credit in an academic concentration. During the spring semester students will have an internship in area science, art or history museums.

THE DEGREE OF MASTER OF ARTS IN EDUCATION

Programs of study leading to the degree of Master of Arts in Education are designed to enable prospective teachers and experienced teachers to increase their professional and academic knowledge and skills and to prepare for special types of educational service. They also provide opportunities for college graduates in other disciplines to acquire needed professional education, as well as study in the subjects which are directly related to their professional objectives.

From the various related departments of the University, the student and an advisor select courses to give the student an adequate background in the chosen field of service. Programs for teachers-in-service and experienced teachers planning to re-enter the profession are differentiated from those for students without teaching experience.

Master's programs are available in the following fields:

Adult Education
College Student Development
Curriculum
Early Childhood Education
Elementary Administration
Elementary Education
Guidance and Counseling
Generic Counseling
Higher Education
Human Kinetics and Leisure Studies (candidates may specialize in adaptive physical education, dance, elementary or secondary school physical education, therapeutic recreation, tourism or urban recreation and parks)
Human Resource Development
Reading
Rehabilitation Counseling
Secondary Administration
Secondary Education
Special Education (candidates may specialize in early childhood special education)
Supervision and Human Relations

For teachers interested in developing or strengthening their academic competence, the elementary and secondary education fields normally permit 15 to 18 semester hours of work in departments other than education. These programs are designed to meet the needs of teachers-in-service who need additional work in content to qualify for advanced certification or to improve their classroom skills and may also be helpful to previously trained teachers planning to re-enter the profession. The major emphasis is upon strengthening both the academic and professional competencies of the teacher.

Additional information concerning these programs may be obtained by writing or telephoning the office of the dean.

Entrance Requirements

A bachelor's degree from an accredited institution, an undergraduate quality-point index of 2.50 or above (C+ average), demonstrated interest in teaching, and personality traits that give promise of success as a teacher, are required. Students whose quality-point index is in the range of 2.3 to 2.49 will be considered for provisional admission. The quality point index is computed on the basis of the last two years of the bachelor's degree program and on all course work completed beyond the baccalaureate. In a number of programs there are more applicants than can be accepted; therefore, selections by additional criteria are necessary.

Two years of successful teaching are required before admission to candidacy in the field of school administration. Experience is required for admission to programs in adult education and human resource development.

ADMISSION TO CANDIDACY

Candidates whose undergraduate preparation does not include equivalents of the basic requirements for the degree of Bachelor of Arts in Education must make up deficiencies and may be required to take designated tests.

ADVANCED STANDING

Advanced standing is granted for approved courses taken at other accredited institutions, but a minimum of 24 semester hours must be completed at this University as a master's candidate.

A maximum of 12 semester hours of advanced courses completed in this University in excess of the requirements for the bachelor's degree may be credited toward the master's degree if the work fits in with the student's plan of specialization.

Advanced standing is not granted for work completed five or more years before application for admission or readmission to master's candidacy.

Requirements for the Degree

PLAN OF STUDY

The plan of study leading to the degree of Master of Arts in Education requires a minimum of 33 hours of graduate credit. The plan may, at the student's option, include a thesis carrying six hours of graduate credit. Whether or not a student selects the thesis option, a minimum of 18 hours must be from courses planned primarily for graduate students (third-group courses). The 18 hours must include a course in research methods and procedures. A minimum of 12 hours, not including the thesis or the research course, must be from courses offered by the School of Education.

Programs may include additional teaching-field preparation. In such cases, however, undergraduate and graduate courses combined must be at least equivalent to the undergraduate requirements for the degree of Bachelor of Arts in Education.

Programs are planned initially in conference with an admission advisor

in the School of Education and subsequently with a designated advisor in the candidate's area of specialization. These programs are based on the candidate's interests and background and on the certification requirements of the state and locality in which the candidate plans to teach.

All degree requirements must be completed within six years.

RESIDENCE

A candidate for the master's degree is required to complete satisfactorily 24 semester hours in residence.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive the grade of *C* in more than six semester hours are subject to suspension. Students who receive a grade of *F* must confer with the dean before enrollment for further work.

THE THESIS

The choice of the thesis subject must be approved in writing by the student's advisor and filed in the office of the dean. A statement of the School of Education standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, an additional calendar year may be granted without further tuition payment. The student must, however, maintain continuous registration (see page 49) during this period. If the preparation of the thesis extends beyond the additional calendar year, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER'S COMPREHENSIVE EXAMINATION

In addition to the course examinations, the candidate must pass a three-hour examination on the chosen area of specialization. Candidates for the examination must be registered for the semester it is to be taken and must file a written application in the office of the School of Education no later than 30 days prior to the date of the examination.

THE DEGREE OF EDUCATION SPECIALIST

The program of advanced study leading to the degree of Education Specialist is for students with master's degrees in education who seek further professional preparation for specific objectives.

Education Specialist programs are available in the following fields:

Administration
Adult Education
Curriculum
Counselor Education
Elementary Administration
Higher Education
Secondary Administration

Entrance Requirements

The degree of Master of Arts in Education from this University (or the equivalent), a satisfactory score on the Miller Analogies Test or the Graduate Record Examination, or grades in graduate course work which meet standards set by the Advanced Graduate Faculty, and two years of successful pertinent experience are required.

Admission to Candidacy

Each applicant must be interviewed and recommended by a staff member of the School of Education or by a representative in the candidate's locality appointed by the dean.

Scholarship

Scholarship requirements for the degree of Education Specialist are the same as those for the degree of Master of Arts in Education (see pages 120–21).

Programs of Study and Degree Requirements

Individual programs are developed, through the faculty-advisor plan, to fit the candidate's skills, interests, and career goals. A maximum of 30 semester hours beyond the requirements of the degree of Master of Arts in Education is required. At least 21 hours of this work must be taken on campus at this University; with the approval of the advisor, the remaining semester hours of the program may be taken in off-campus offerings of the GWU College of General Studies or at another approved university. A maximum of five calendar years is allowed for completion of the program.

At least 12 of the required 30 hours must be in appropriate graduate courses in education selected from the following areas: (1) foundations and cognate study, (2) background and general principles of the field of study, (3) an area of specialization.

The Comprehensive Examination

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

THE DEGREE OF DOCTOR OF EDUCATION

The School of Education offers programs of advanced study leading to the degree of Doctor of Education. These programs, which are under the supervision of the Advanced Graduate Faculty, provide major fields of study in teacher education, special education, counselor education, administration and curriculum, adult education, human development, human resource development, and higher education. Supporting fields are available in administration, administration of higher education, adult education, college student development, counselor education, curriculum, elementary education, higher education, human growth and development, human resource development, reading, secondary education, special education, supervision, and teacher education. With the approval of the Advanced Graduate Faculty and the departments concerned, one supporting field may be taken in other departments of the University. All programs require study of interrelated areas of education and a doctoral dissertation in the major field of study.

Admission

The applicant must have adequate preparation for advanced study, including graduate work in fields prerequisite to his or her objective, equivalent to that required for the degree of Master of Arts in Education at this University, at least three years of successful pertinent educational experience, acceptable personal qualities, and a capacity for creative scholarship and effective leadership.

The applicant first arranges for an interview with the assistant dean to explore the applicant's needs in relation to the resources of the School and to guide the student in applying for doctoral study. The required procedures and standards will be explained at this time. Candidates meeting the initial standards are admitted to precandidacy for the degree.

PRECANDIDACY

In the precandidacy period a minimum of nine semester hours of course work in the program, including requirements specified by the Advanced Graduate Faculty, must be completed. This work must be completed within three semesters of admission to precandidacy, for part-time students, or within the first 18 semester hours of course work for full-time students. Application for full candidacy will then be decided on the basis of the quality of scholarship in the precandidacy period, the recommendations of instructors, a detailed plan for the balance of the program, and a qualifying examination.

Plan of Study

In general, from two to three years of full-time study beyond the degree of Master of Arts in Education, or the equivalent in part-time study, are required. Programs are individually planned. It is estimated that, for the average student, the work required for the total program will be 75

semester hours, including a minimum of 12 semester hours of dissertation research.

Each program is divided into two parts. The first consists of preparation for comprehensive examinations in a major field of study and two supporting fields, and completion of a required research tool field. The second is composed of research investigation, the writing of a dissertation, and the final oral examination.

Students who have completed the comprehensive examinations and who were not registered for doctoral study under the payment plan in effect prior to July 1, 1967, must register for a minimum of six semester hours of *Dissertation Research* (Educ 491) per semester until 12 hours have been completed, and a minimum of three semester hours a semester thereafter until the satisfactory completion of the final examination.

COMPREHENSIVE EXAMINATIONS

Upon admission to doctoral candidacy the student is assigned to a committee, each member of which is responsible for guiding the preparation for one of the required comprehensive examinations in supporting fields or the major field comprehensive examination. The candidate must arrange individual conferences with the committee members to determine the content of each field and to receive guidance in preparation for the examination.

The supporting field examinations, which are taken first, are three-hour written examinations. In addition to the research tool field a student who plans a historical research investigation for the dissertation must complete an appropriate research seminar offered by the Department of History. The student's dissertation committee may recommend other tool requirements. The tool requirement must be completed prior to the major field examination. The major field examination is a written 12-hour examination, six hours on each of two successive days.

The candidate begins the second part of the program after the satisfactory completion of all supporting field examinations, the required research tool field and the major field examination.

THE DISSERTATION

A dissertation is required as evidence of ability to perform scholarly research and to interpret and present its results.

During the first part of the program, the dean appoints a dissertation committee, consisting of a major advisor as director, usually a major field advisor, and two additional faculty members who serve as readers. The candidate is required to submit a proposal for the dissertation to this committee, which determines its acceptability and recommends approval to the Committee on Advanced Graduate Studies. The dissertation is completed under the guidance of the director, with the advice of the other members of the dissertation committee.

No later than the date specified in the calendar, the candidate must submit to the dean five complete copies of the dissertation and two copies of an abstract for inclusion in the announcement of the examination and for reproduction by University Microfilms, Inc. Printed copies of detailed

egulations regarding the form and reproduction of the dissertation, prep-ration of the abstract, and services offered by University Microfilms, Inc., re available in the office of the dean. The successful candidate for the octorate is required, before receiving the degree, to pay a fee to cover he expense of printing the Announcement of the Final Examination and to over the basic service rendered by University Microfilms, Inc., and to ign a microfilm agreement.

HE FINAL EXAMINATION

When the dissertation has approval of the director, the candidate is recommended to the dean for the final oral examination, which must be passed at least three weeks before the degree is to be conferred. The examination s open to the public and is conducted by a committee of the faculty, appointed by the dean, supplemented by at least two leaders in the candidate's field of study from outside the University. Candidates who successfully pass the oral examination are recommended for the degree by the faculty of the School of Education.

Residence and Continuous Study

All the preparation for the degree, including examinations, courses, seminars, and other work done under the direction of an advisor, must be done in residence. The student must remain registered in the School of Education, except when the dean or the Advanced Graduate Faculty has granted a leave of absence. Failure to register each semester of the academic year may result in lapse of candidacy. Subsequent readmission is subject to whatever new conditions and regulations have been established by the Advanced Graduate Faculty.

The supporting and major field examinations must be completed within five years of the date of admission, and the entire program must be completed within eight years, regardless of full-time or part-time study. All candidates must satisfy one of three options for full-time study. Information concerning these plans will be provided by the assistant dean upon request by the candidate.

SPECIAL PROGRAMS AND SERVICES

Education of Teachers of Exceptional Children

The School of Education offers a program for the education of teachers of exceptional children. Laboratory experiences are arranged in schools for handicapped children in the metropolitan area. Students are accepted at the junior- or senior-year undergraduate, master's, education specialist, and doctoral levels. By special permission, teachers, school administrators, and adequately prepared students from other schools and colleges of the University may elect these courses. Inquiries concerning the program and the availability of scholarships and fellowships should be directed to Dr. Perry Botwin, Department of Special Education, George Washington University, Washington, D.C. 20052.

Graduate Program in Rehabilitation Counseling

This federally funded master's degree program trains rehabilitation co selors to assist those who are disabled or disadvantaged to assume a p in society. The two-year program combines fieldwork and coursewor preparing students for employment in an expanding field that yields humanitarian rewards. Both the profession and the program are in disciplinary, drawing upon such related areas as guidance, medicine, chology, social work, sociology, and special education.

Inquiries concerning the program, the availability of traineeships full-time students and applications should be directed to Dr. Daniel Sit Rehabilitation Counselor Education, George Washington University, W ington, D.C. 20052.

Graduate Specialization in Therapeutic Recreation and Adaptive Physical Education

This master's degree program in the field of physical education, wit specialization in therapeutic recreation or adaptive physical educatio funded by the Bureau of Education for the Handicapped, U.S. Offic Education. Both programs require an intensive internship (minimum o clock hours) in University-affiliated training centers in Washington hospitals, schools, clinics, and public agencies. Inquiries concerning program and the availability of graduate research assistantships and ternships should be directed to Dr. Donald Hawkins, Department of Hu Kinetics and Leisure Studies, George Washington University, Washing D.C. 20052.

Certification Curricula

The School of Education provides individually planned programs liberal arts graduates with appropriate degrees from accredited in tions who wish to prepare for teaching. Those seeking certification not wishing to work for a degree, may enroll in a certification progra they meet the admission, scholarship, and personality requirement degree candidates. The School also provides a wide range of course interest to teachers who wish to renew licenses.

Reading Center

(See pages 54–55)

The Speech and Hearing Clinic

(See page 54)

Off-Campus Degree Programs

The School of Education has academic jurisdiction over the off-cam programs leading to the degree of Master of Arts in Education in fields of elementary education: generic counseling: guidance and coun ing: higher education: human resource development: secondary educat special education—early childhood special education: and supervision

man relations. The degree of Education Specialist is offered in administration and higher education.

These degree programs are administered by the College of General udies. For details concerning the off-campus programs see the *College General Studies Bulletin.*

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION

Dean P.B. Vaill
Associate Dean H.R. Page
Assistant Deans K.J. Darr, J. Lobuts, Jr.

FACULTY*

Professors F. Amling, F. Belaunde-Terry *(Visiting)*, G. Black, D.S. Brown, B. Burdetsky, M.C. Devolites, R.B. Eastin, A. El-Ansary, R.F. Ericson, L. Gintzig, P.D. Grub, J. Harvey, P.M. Horvitz *(Visiting)*, W. Keegan, G.P. Lauter, E.J.B. Lewis, G.L. Lippitt, N.M. Loeser, H. Malmgren, A.J. Mastro, D.C. McGrath, Jr., H.R. Page, D.D. Roman, E. Timbers, P.B. Vaill, J. Zwick
Adjunct Professor F. Gutheim
Associate Professors E.B. Adams, R.R. Bonato *(Research)*, S.R. Chitwood, J.P. Coyne, K.J. Darr, S.F. Divita, R.F. Dyer, R. Eldridge, S.S. Fuller, M.G. Gallagher, S Greene, W.C. Handorf, W.W. Hardgrave, M.M. Harmon, R.L. Holland, F.C. Kurtz, J.F. McCarthy, Jr., C.R. Miller, C. Paik, P.N. Reeves, T.E. Shaughnessy, S.N. Sherman, W.E. Smith, E.K. Winslow
Adjunct Associate Professors P.S. Birnbaum, H.C. Demoody, W.J. Green, Jr., J. Lobuts, Jr., R.L. White
Assistant Professors G. Bodnar, B.L. Catron, B. Dawson, E.H. Forman, D. Gale, W.H. Guy *(Research)*, G.J. McHugh, J.M. Sachlis, R.G. Shouldice, S. Umpleby, C.W. Washington, P. Welling, K.C. Yang *(Research)*
Adjunct Assistant Professors P.J. Collier, S.T. Fisher, J.J. Geer, C.V. Gordon
Instructors D.F. Bergwall, P.A. Cleary *(Research)*, C.P. McKelvey, C.W. Miller, R. Switalski *(Research)*
Adjunct Instructors R.W. Black, J.E. Bruhn, R.S. Capps, F.W. Carter, M.S. Duny, A. Hammad, C.H. Hayes, C. Herbert, W.C. Parrish, R.A. Payton

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are ex officio members of the Faculty of the School of Government and Business Administration.

Committees*

DEAN'S COUNCIL

B.L. Catron *(Chairman)*, J.P. Coyne, S. Greene, G.J. McHugh, C. Paik, D. Roman

COMMITTEE ON CURRICULUM AND PROGRAMS

H.R. Page *(Chairman)*, F. Amling, D.S. Brown, M.C. Devolites, E.H. F man, D.E. Gale, M.G. Gallagher

COMMITTEE ON DOCTORAL STUDIES IN BUSINESS ADMINISTRATION AND PUBLIC ADMINISTRATION

G.P. Lauter *(Chairman)*, S.R. Chitwood, S.S. Fuller, W.W. Hardgrave, Mastro, P.N. Reeves, J.M. Sachlis

INTRODUCTION

This School was organized as the School of Government in 1928. Dur the next two decades, programs in business administration and public a ministration were added, and the emphasis gradually shifted from und graduate to graduate study. The name was changed in 1960 to the Sch of Government, Business, and International Affairs to reflect more a curately the offerings of the School. A division of the School was effec in 1966, and two schools were established—the School of Government a Business Administration, a primarily professionally oriented school; a the School of Public and International Affairs, a primarily policy-orient school.

Objectives

The principal objective of the School of Government and Business A ministration is to prepare its graduates for positions in the management complex organizations in both business and government. The degree pr grams are designed to prepare students both for *entrance* into busine and government and for *advancement* to high-level management positio

Programs in the School include examination of administrative princip and quantitative approaches to decision-making common to both busine and government. These programs stress the points at which major pol decisions of either business or government must give consideration to r lated policy decisions of the other. Emphasis is placed on the fact th management education is not limited to organizational techniques but in the broadest sense, education for management responsibility.

It is the policy of the School to emphasize a broad fundamental educ tion as the best preparation for positions carrying management or admi trative responsibility.

Undergraduate programs concentrate the first two years in a broad lib eral arts curriculum drawn fom the social sciences, humanities, quanti tive methods, and a limited number of courses in administration. Studen in the junior and senior years expand their work to include (1) the fur

* The Dean of the School is an ex officio member of all committees.

ions of business enterprise, (2) the economic and legal environment of business, (3) the implications of modern analytical techniques based on quantitative methods, (4) the study of organization theory and human relations, and (5) the practice of problem-solving techniques.

Graduate programs develop the elements common to all management positions regardless of the nature of the operation. Master's degree programs are based on study of the principles of management, human relations and problem-solving plus an area of specialization.

The student body is comprised of both full- and part-time students, which necessitates the scheduling of classes both during the day and in evenings after normal working hours. All students should anticipate some evening classes. The presence of working students is viewed as an enrichment of the evening class sessions.

Responsive to the needs of the Washington community, the School has followed the policy of making many of its educational activities available in off-campus centers in the metropolitan area. The off-campus work leads to a degree carrying a different designation; thus, the Bachelor of Business Administration degree on campus has a substantial equivalence to the Bachelor of Science in Administration degree offered off campus in facilities furnished by government or business organizations. The School is offering a Bachelor of Science in Health Care Administration degree, at this time limited to students at the Naval School of Hospital Administration, Bethesda, Md. The Master of Arts in Health Care Administration, Master of Business Administration, Master of Public Administration, and Master of Urban and Regional Planning degrees are offered on campus, while the Master of Science in Administration degree is the only graduate degree offered off campus. The off-campus programs have strong support in the area and provide significant contact with the business and government communities. Programs of study leading to the degrees of Bachelor of Science in Administration and Master of Science in Administration are listed in the *College of General Studies Bulletin.*

Academic Status

The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and Certified Management Accountant professional examinations. The program in hospital administration is accredited by the National Accrediting Commission on Education for Health Services Administration. The Master of Urban and Regional Planning degree program is recognized by the American Institute of Planners.

Common Body of Knowledge

Programs leading to the degrees of Bachelor of Business Administration, Bachelor of Science in Administration and Master of Business Administration include the equivalent of at least one year of work in the following areas:

1. A background of the concepts, processes and institutions in marke ing and distribution, production and financing functions.
2. A background of the economic and legal environment of business a government enterprise, along with consideration of the social and politic influences on business.
3. A basic understanding of the concepts and methods of accountin quantitative methods and information systems.
4. A study of organization theory, interpersonal relationships, contr and motivation systems, and communications.
5. A study of administrative processes under conditions of uncertaint including the integration of analysis and policy determination at the ove all management level.

Fellowships

The School of Government and Business Administration has sever graduate fellowships available to its students, including the Aryame Research Fellowships in International Business, Health Care Administr tion Fellowships, Ernst and Ernst Grant to Doctoral Candidates in Busine or Economics, the National Association of Purchasing Management Fello ship, the Scottish Rite Foundation Fellowships and the Wolcott Found tion Scholarships.

REGULATIONS

Regulations concerning admission, registration, fees and finances a stated on pages 20–33; other University regulations, on pages 44–53.

Attendance

A student may not attend classes until registration is completed and fe due are paid. A student may be dropped from any course for und absence.

The student is held responsible for all the work of the courses in whic registered, and all absences must be excused by the instructor in char before provision is made for the student to make up the work missed.

A student suspended for any cause may not attend classes during t period of suspension.

Withdrawal

Withdrawal from a course or from the University without academic pena is permitted during the first four weeks after registration for the fall spring semester. Withdrawal after this period is permitted only in unusu circumstances, and requires certification by the instructors of courses f which the student is registered that the student is doing passing work (se "Withdrawal," page 47).

Adding Courses

Courses may not be added after the first full week of classes in a semester or summer session.

ndependent Study Plan

A student of *demonstrated capacity*, with a special interest in the subject matter of a course, may be permitted to undertake study under the personal direction of an instructor, in accordance with the rules of the appropriate department. Credit under this plan is limited to the specific course credits normally allowed when taken on a class basis.

THE BACHELOR OF BUSINESS ADMINISTRATION DEGREE

The School offers programs leading to the degree of Bachelor of Business Administration in the fields of accounting and business administration.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class are as follows:

(A) 1. An acceptable certificate of graduation from a U.S. secondary school, showing at least 15 units* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and two years of college preparatory mathematics. Students admitted with deficiencies in secondary school units will be required to begin removing such deficiencies by appropriate courses or examinations within the first year in which they are enrolled in this University.

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting such a certificate must also show competence in the English language and may be required to enroll in a full-time program in English before beginning studies in a degree program.

2. College Entrance Examination Board scores submitted on the Scholastic Aptitude Test and the English Composition Achievement Test.

It is recommended that the examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, 20 Nassau St., Princeton, N.J. 08540, or 1947 Center St., Berkeley, Calif. 94704, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

The School of Government and Business Administration will consider

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

the adequacy of the qualifications of an applicant who, because of unusu circumstances, does not present all of the formal requirements stat above. The School may prescribe appropriate scholastic-aptitude tests the University.

(B) Students who have been out of secondary school for three years more and/or do not meet the above requirements may take a spec battery of admission tests* by contacting the Office of Admissions or ma be considered for admission to the School of Government and Busines Administration on a conditional basis. To be admitted into the School degree program, a conditionally admitted student must complete a tri program of 15 semester hours of course work with a quality-point inde of 2.5 or higher. This trial program must include one course each in a counting, economics, English, and science, to be selected from the first-yea curriculum of the Bachelor of Business Administration degree program.

The selection of courses to be taken in the trial program must be ma in conference with a faculty advisor in the School of Government an Business Administration. A conference concerning plans for study as degree candidate is required of each applicant at the beginning and en of the trial program. Upon successful completion of the trial program, th student who has submitted a degree-candidate application will be advance to degree status.

Admission with Advanced Standing

Requirements for admission of students transferring from other regional accredited colleges and universities and from other divisions of th University, are as follows:

(A) Students who have accumulated 30 hours or more of academ credit at another regionally accredited college or university in which the earned a 2.00 or higher quality-point index may be admitted to the Scho of Government and Business Administration. Advanced standing may awarded for properly certified courses taken at regionally accredited co leges or universities for which the student received a grade of C or bette and may be applied toward a degree provided they are comparable the curricular requirements of the degree.

In no case will more than 60 semester hours of advanced standing b granted for course work completed at regionally accredited communit or junior colleges. Accounting and business administration courses taken such colleges may be applied toward the Bachelor of Business Administra tion degree provided they are comparable to BAd 161, Mgt 118, 119, or St 97. Other courses (one course per area up to a maximum of three courses comparable to this School's courses numbered 101-200, taken at an ac credited community or junior college where a grade of C or better ha been earned may be accepted to waive certain required courses. Th waiver of a required course does not entitle the student to any semester hours of credit.

Although a grade of *D* is not acceptable for transfer, the course may b used to satisfy a curricular requirement. Credits earned with a *D* grad may not, however, be counted toward the total number of semester hour

* These tests include, among others, the Differential Aptitude Test, Cooperative English Exami nation and Ohio Psychological Test.

required for the degree. Any course completed with a grade of *D* or better may not be repeated for the purpose of earning degree credit.*

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, George Washington University, Washington, D.C. 20052.

(B) Students may transfer into a degree program in the School of Government and Business Administration after completing at least 12 or more semester hours in another degree-granting division of this University provided the student has an accumulated quality-point index of 2.00 or higher at the time of transfer. A student wishing to transfer into the School from another division of this University must submit a formal application of transfer to the Office of Admissions.

Courses taken at another division of this University may be applied toward a degree in this School provided they are comparable to the curricular requirements of the degree. A maximum of 90 semester hours of transfer credit may be applied toward a degree program in this School.

In no case will credit for more than 15 semester hours of undergraduate coursework taken at this University before admission as a candidate for the degree of Bachelor of Business Administration be allowed toward meeting degree requirements in the School of Government and Business Administration.

(C) Students applying for transfer from another accredited college or university or from another division of this University whose previous academic records raise doubts of their ability to complete degree requirements successfully may be admitted to the School of Government and Business Administration on a conditional basis. To be admitted into the School's degree program a conditionally admitted student must complete a trial program of 15 semester hours of course work with a quality-point index of 2.5 or higher. A student registered in another division of this University who has an accumulated quality-point index of less than 2.00 and who is conditionally admitted to this School must earn a 2.5 quality-point index in the trial program and must during this trial program bring the accumulated quality-point index to 2.00 or higher to be admitted to the School's degree program.

The selection of courses to be taken in the trial program must be made in conference with a faculty advisor in the School of Government and Business Administration. A conference concerning plans for study as a degree candidate is required of each applicant at the beginning and end of the trial program. Upon successful completion of the trial program, the student who has submitted a degree-candidate application will be advanced to degree status.

Readmission

A student who withdraws, is suspended or is otherwise absent from the University for one semester or more must make formal application for readmission. If readmitted, the student is subject to the rules and regula-

* An exception to this rule is the freshman English composition requirement. Any student earning a grade lower than C in English composition at another institution may be required to repeat the course(s) at this University.

tions in force at the time of return. If the student has attended one o more regionally accredited colleges or universities during absence from th University, complete official transcripts must be sent to the Office of A missions from each institution attended.

The application fee is waived for a student applying for readmission wh was registered as a degree candidate at the time of last registration at th University and who has not since registered at another college or un versity.

REQUIREMENTS FOR THE DEGREE

Academic Work Load

A full-time student not on probation may not ordinarily take more tha 15 semester hours. A student employed more than 24 hours a week, wh is not on probation, may not take more than nine semester hours.

A full-time student whose overall quality-point index is 3.50 or high may take up to 18 semester hours. A student employed more than 24 hou a week, whose index is 3.50 or higher, may take up to 12 semester hour

A student who accepts employment after registration or at any tim during a semester must report immediately to the Dean, so that the progra may be adjusted if necessary.

Exception to these rules will require the approval of the Dean.

An undergraduate student on probation may take no more than semester hours of course work.

Scholarship Requirements

To graduate, a student must have the following: (1) a general quality-poi index of at least 2.00 and (2) a quality-point index in the major of at lea 2.00. All courses in the Bachelor of Business Administration degree ma or option are to be included in the quality-point index calculation. Electi courses in or out of the School of Government and Business Administrati cannot be used as substitutes in the major quality-point index calculatio

DEAN'S HONOR LIST

The names of students who achieve a quality-point index of 3.50 or high are placed on the Dean's Honor List for that semester. Appearance on t list will be limited to (1) full-time students registered for a minimum of semester hours and (2) part-time students registered for a minimum of semester hours over a period of two consecutive semesters, which m include a summer term.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or W (Authoriz Withdrawal) may be assigned are described on page 46.

The grade of *I* must be removed no later than the last day of th examination period for the fall or spring semester immediately followin

he semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an F. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the Dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

PROBATION

A student whose cumulative quality-point index falls below 2.00 after completing a minimum of 12 semester hours of study will be placed on probation. This probation extends over the period in which the student attempts 12 semester hours of work, which may include remedial studies as prescribed.

SUSPENSION

A student whose quality-point index is 1.50 or below or whose index remains below 2.00 at the end of the probationary period may be suspended. A student suspended for poor scholarship may apply for readmission after the lapse of either the fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. A student readmitted after suspension is on probation and must maintain a current quality-point index of at least 2.50 on each 12 semester hours of work undertaken until the cumulative index is 2.00. In no case will the probationary period after readmission exceed 24 hours of study. A student suspended twice for poor scholarship will not be readmitted.

CREDIT/NO CREDIT OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better, may, with the approval of the advisor and the Dean, take one course a semester and receive a grade of CR, Credit, or NC, No Credit, which will be recorded on the student's transcript but will not be reflected in the quality-point index. No student will be allowed to take more than four credit/no credit courses. A student must sign up for such an option at registration. Under no circumstances may a student change from credit no credit status to graded status, or vice versa, after the end of registration. Courses required in the student's major field may not be taken on the credit/no credit basis. A transfer student may not choose this option until the second semester of enrollment in the University.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Government

and Business Administration. This requirement applies to students trans ferring within the University, as well as to students transferring from othe institutions. Unless special permission is granted by the Dean to pursu work elsewhere, the work of the senior or final year must be complete in the School of Government and Business Administration.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfa tory may be reported by the instructor to the Dean. The Dean may assig supplementary work, without academic credit, varying in amount with th needs of the student. If the work prescribed is equivalent to a course, th regular tuition fee is charged. The granting of a degree may be delaye for failure to make up such deficiency in English to the satisfaction of th Dean.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree in the School of Government an Business Administration.

Earning Credit or Waiving Requirements by Examination

A student may earn credit up to a maximum of 30 semester hours o waive curricular requirements by performing satisfactorily on the followin tests:

College-Level Examination Program (CLEP)—CLEP offers two types o examinations: (1) CLEP Subject Examinations are offered in 29 subje areas. These tests measure achievement in the equivalent of specif college-level courses. (Credit may not be earned by passing the examin tion after having taken the equivalent course.) CLEP examinations i Introductory Accounting, Introduction to Business, Commercial Law, an Data Processing are limited to three credits each of advanced standin All other CLEP examinations in accounting and business administratio (School of Government and Business Administration courses) are n accepted for advanced standing. Students enrolled in George Wash ington University who wish to receive credit for CLEP Subject Examina tions must receive prior approval of the department. (2) CLEP Gener Examinations are offered in five areas: mathematics, social science humanities, the natural sciences and English composition. (Credit—a vanced standing—is not given for the General Test in English compo tion.)

Advanced Placement Tests—See page 22.

Achievement Tests—See pages 23–24.

Examinations for Waiving Curriculum Requirements—The School Government and Business Administration does not administer waiv examinations. However, certain liberal arts courses may be waived, a in some instances credit may be assigned, by satisfactorily passing special departmental examination authorized and prescribed by the d partment or curricular advisor concerned. Requests to take the examin tion should be made to the curricular advisor and the required fee pa

at the Office of the Cashier before the date set for the examination. See page 76 for more information.

CURRICULUM REQUIREMENTS

One hundred and twenty semester hours of course work are required for graduation. To be recommended by the Faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work, a minimum of 60 semester hours (second-group course work) in the junior and senior years selected from one of the two major field curricula offered by the School.

Curriculum for the First Two Years in Accounting and Business Administration

FRESHMAN YEAR

		Semester Hours
Acct:	Acct 1–2	6
Econ:	Econ 1–2	6
Engl:	Engl 9 or 10, 11	6
Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geog 51 and 52; Geol 1–2; or Phys 1 and 2, 3 and 4, or 9–10	6–8
*Elective:	Courses other than in accounting, business administration or economics	4–6
	Total	28–32

SOPHOMORE YEAR

BAd:	BAd 51	3
Humanities:	Art 31 32 or 71 72; Chin 3–4; Engl 51 52, 71 72, or 191 92; Fren 3–4 or 6, or 51–52; Germ 3–4 or 51 52; Ital 3–4; Mus 3 and 4; Phil 50, 71; Rel 9–10, 21, 22, 23, 59, 60; Slav 3–4, 5–6, or 91–92; Span 3–4 or 6, or 51–52; or SpDr 1 and 11, or 11 and 111 (Accounting majors may postpone this requirement until the junior year if they wish to take Acct 121 or 191 in the sophomore year)	6
Math:	Math 31 and 32, or 51 and 52	6
Social Studies:	Psyc 1, 8	6
	AmCv 71–72; Anth 1–2; Hist 71–72; PSc 1 and 3 or 2 and 3; or Soc 1 and 2	6
Stat:	Stat 51	3
	Total	30

Accounting Major

JUNIOR YEAR

Acct 101:	Cost and Budgetary Control	3

* Courses in human kinetics and leisure studies may not be taken for credit.

*Acct 121:	Intermediate Accounting	3
Acct 161:	Federal Income Taxation	3
*Acct 191:	Advanced Accounting	3
BAd 102:	Fundamentals of Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
BAd 161:	Commercial Law	3
Mgt 118:	Introduction to Information Processing	3
Elective:	Selected from courses other than in accounting, business administration or economics	6
	Total	30

SENIOR YEAR

Acct 132:	Accounting Theory	3
Acct 171:	Auditing	3
Acct 181:	Accounting Systems	3
BAd 101:	The Business Environment	3
BAd 181:	Manufacturing Production	3
BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
Stat:	Three semester hours selected from the following:	3
	Stat 111: Business and Economic Statistics I	
	Stat 155: Introduction to Probability	
	Stat 187: Theory of Sampling	
Elective:	Three semester hours selected from courses in accounting†, business administration or economics, and three semester hours selected from courses in other departments	6
	Total	30

ACCOUNTING PRACTICE INTERNSHIP

An internship program, limited to selected senior accounting majors, is available during the semester break of the senior year. To be admitted to this program students must have the approval of the chairman of the Department of Accounting and must have completed at least 15 semester hours of accounting courses (including a course in auditing) with a 2.85 or higher average and an over-all grade of 2.50 by the end of the fall semester. Students will be paid a salary while conducting audits under senior supervision of participating C.P.A. firms. Other internships with industry and government are available. Students who complete the internship successfully will register for Acct 199 the spring semester of their senior year and will receive three semester hours of credit. For further information consult the chairman of the Department of Accounting.

* If Acct 121 and 191 are elected in the sophomore year, students replace this requirement with six semester hours of humanities (see above).
† Qualified students accepted in the accounting internship program will elect Acct 199 in place of three semester hours of electives selected from courses in accounting, business administration, or economics.

Business Administration Major

The program in business administration is designed to provide the broad foundation required for eventual leadership in either governmental or business administration. It consists of the 36 semester hours of *required* courses; 15 hours in one of the following group options; and nine hours of electives, normally advanced courses in liberal arts subjects.

JUNIOR YEAR

		Semester Hours
Acct 193:	Business Budgeting	3
BAd 102:	Fundamentals of Management	3
BAd 105:	Personnel Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
Mgt 118:	Introduction to Information Processing	3
Group Option:	Six semester hours selected from the chosen area of specialization (see below)	6
Elective:	To be selected in consultation with the advisor	6
	Total	30

SENIOR YEAR

BAd 101:	The Business Environment	3
BAd 161:	Commercial Law	3
BAd 181:	Manufacturing Production	3
*BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
Psyc 144:	Personnel and Industrial Psychology	3
Group Option:	Nine semester hours selected from the chosen area of specialization (see below)	9
Elective:	To be selected in consultation with the advisor	3
	Total	30

GROUP OPTIONS

Seven areas of specialization are open to business administration majors. The 15 hours taken in each of these options require the approval of the advisor. The group option and the individual courses within the option should be selected *at the beginning of the junior year.* The student should contact the chairman of the Department of Business Administration for assignment of an advisor.

Group I: Economics

The following courses provide the basic academic foundation for such positions as financial economic analyst, industrial economic analyst, and market research analyst in business and government.

* International business majors must complete BAd 178 in lieu of BAd 198.

BAd 132:	International Business Finance
BAd 133:	Capital Formation
BAd 176:	International Business Theory and Policy
*Econ 101:	Intermediate Microeconomic Theory
*Econ 102:	Intermediate Macroeconomic Theory
Econ 158:	Industrial Organization
Econ 161, 162:	Public Finance I, II
Econ 181–82:	International Economics
Stat 111, 112:	Business and Economic Statistics I, II

Group II: Finance

The following courses provide the basic academic foundation for such positions as credit analyst, supervisor in a financial institution, bond cashier, trust officer, bank examiner and similar positions in federal or international financial institutions.

*Acct 111:	Financial Statement Analysis
Acct 121:	Intermediate Accounting
BAd 113:	Real Estate
BAd 121:	Fundamentals of Insurance and Risk Management
BAd 122:	Insurance and Estate Planning
BAd 132:	International Business Finance
BAd 133:	Capital Formation
*BAd 138:	Investment and Portfolio Management
Econ 101:	Intermediate Microeconomic Theory

Group III: Information Processing

The following courses provide the basic academic foundation for positions in information processing in government, business, and industry. They also give the student an understanding of the manager's use of information processing as a vital managerial technique.

*Mgt 119:	Computer Programming for Information Systems
*Mgt 120:	Information Systems Development I
*Mgt 121:	Information Systems Development II
*Mgt 122:	Special Studies in Information Systems

One additional three-credit course approved by the advisor

Group IV: International Business

The following courses provide the basic academic foundation for positions in international business, both in private industry and in government. Students in this option who have received credit for two years of a modern foreign language, or the equivalent, are required to take only 12 semester hours from the following courses.

*BAd 132:	International Business Finance
*BAd 144:	International Marketing Management
BAd 171:	Principles of Transportation
*BAd 175:	Introduction to International Business
BAd 176:	International Business Theory and Policy
*BAd 178:	International Business Policy and Operations
Econ 181–82:	International Economics

* Required for this group option.

Group V: Marketing

The following courses provide the basic academic foundation for such positions as sales manager, marketing manager, product development manager, research director, buyer, advertising director, sales promotion manager, and credit manager.

*BAd 143:	Marketing Research
BAd 144:	International Marketing Management
BAd 145:	Sales Management
BAd 147:	Advertising
BAd 158:	Physical Distribution Management
BAd 171:	Principles of Transportation
BAd 175:	Introduction to International Business
BAd 178:	International Business Policy and Operations
Jour 145:	Principles and Problems of Public Relations
Stat 111, 112:	Business and Economic Statistics I, II

Group VI: Personnel Management

The following courses provide the basic academic foundation for such positions as personnel manager, employee relations manager, and employment manager in business and government service.

*BAd 106:	Leadership in Personnel Management
*BAd 107:	Collective Bargaining
Jour 145:	Principles and Problems of Public Relations
Psyc 129:	Theories of Personality
Psyc 131:	Psychological Tests
SpDr 121:	Group Discussion and Conference Leadership

Group VII: Statistics

The following courses provide the basic academic foundation for such positions as financial statistician, planning statistician, industrial statistician, and rate analyst in business and government.

Stat 91:	Principles of Statistical Methods
*Stat 111, 112:	Business and Economic Statistics I, II
Stat 117:	Analysis of Variance
Stat 118:	Regression Analysis
Stat 155:	Introduction to Probability
Stat 157–58:	Introduction to Mathematical Statistics

THE MASTER'S DEGREES

Master of Business Administration—The degree of Master of Business Administration is this School's principal professional degree in business. It is designed to develop the analytical ability and perspective which will contribute to success as a responsible executive. Because of the increasingly close relationship between government and business, the programs for this degree also provide an excellent background for many government careers.

* Required for this group option.

Master of Public Administration—The degree of Master of Public Administration is primarily for those already in government service—federal, state, local, intergovernmental, or international—or for those seeking management careers in government. The program provides students with an appreciation of the special requirements of public service, while at the same time helping them to improve their own analytical and decisional capabilities. The degree is interdepartmental in nature, but the major emphasis is in the Department of Public Administration.

Master of Arts in Health Care Administration—This professional degree is designed to prepare students with interdisciplinary training for professional practice in administration and planning roles in public and private health organizations. Study may be made of various aspects of administration of short-term hospitals, long-term health facilities (such as extended-care institutions, nursing homes, mental hospitals, facilities for the aged), group practice clinics, health information systems, and comprehensive health planning agencies.

Master of Urban and Regional Planning—This professional planning degree is designed as preparation for careers on the municipal, county, state and national levels in both public service and private consulting practice. The program of study is planned to provide a broad professional education, to develop competence in planning theory and methodology, and to emphasize the analytical ability and creativity necessary for solving urban and regional problems.

Master of Science in Administration—The Master of Science in Administration degree is offered only off campus. It provides a course of study appropriate for those students currently working in government and business. It is a professional degree, preparing graduates for higher positions and greater responsibility and generally improving their competence as administrators.

ENTRANCE REQUIREMENTS

To be considered for admission applicants must present the following minimum credentials: a bachelor's degree from a regionally accredited college or university, including at least 90 semester hours of academic work with an overall quality-point index of 2.50 (on a 4.00 scale) and a score of at least the 50th percentile on the applicable admission test.

Applicants whose undergraduate quality-point index is less than 2.50 or whose admission test score ranks beneath the 50th percentile will be considered if (1) the quality-point index multiplied by 200 and added to the admission test score equals 950 points, or (2) the upper division undergraduate (last two years of undergraduate work) quality-point index multiplied by 200 and added to the admissions test score equals 1,000 points.

Applicants for admission to programs leading to the degree of Master of Business Administration must submit acceptable scores on the Graduate Management Admission Test; applicants for admission to programs leading to the degrees of Master of Arts in Health Care Administration*, Master

* Scores on the Miller Analogies Test are also accepted in place of the Graduate Management Admission Test or the Graduate Record Examination for admission to the program of study leading to the degrees of Master of Arts in Health Care Administration and Master of Public Administration.

of Public Administration, and Master of Urban and Regional Planning must submit scores on the Graduate Management Admission Test or the Graduate Record Examination. It is the responsibility of the applicant to make arrangements for the required test with the Educational Testing Service, Princeton, N.J. 08540. Correspondence concerning the Graduate Management Admission Test should be addressed to Box 966; concerning the Graduate Record Examination, to Box 955.

Waiver of the admission test may be requested, by letter, by applicants who meet the following criteria: (1) the undergraduate quality-point index exceeds 3.00, (2) the undergraduate degree was conferred no more than five years previously, and (3) the undergraduate major was a discipline which supports the graduate program for which the application is made. The Admissions Committee will inform the applicant of whether or not the waiver will be granted.

GENERAL REQUIREMENTS

Extended programs, including undergraduate background courses, may be assigned for an applicant whose undergraduate degree was in a field other than the graduate program the student wishes to follow, or whose undergraduate record indicates a weakness in required background courses.

Master's degrees are awarded by vote of the Faculty on completion of the required course work, an acceptable thesis (if one is elected or required) or the equivalent work, and the passing of the Master's Comprehensive Examination.

Second-group courses (numbered 101-200) may be counted toward the master's degree only when registration for graduate credit has been approved at the time of registration by the Dean and the curriculum advisor. No work counted toward a bachelor's degree may be counted toward a master's degree.

Full-time students are normally expected to register for nine to 12 semester hours each semester. A graduate student who is employed more than 20 hours a week may not take more than six semester hours. All work for a master's degree *must be completed in five years, unless* an extension of time is granted by the Dean. Continuous registration does not serve the purpose of extending a student's degree candidacy beyond the five-year time limit.

Students who expect to continue studies for the degree of Doctor of Business Administration or Doctor of Public Administration after receiving the master's degree should ask for assistance in planning programs so that they may qualify for admission to candidacy for the doctorate.

No credit is granted for work done *in absentia* or without formal instruction, except for hospital residency, supervised field experience and the thesis, which may be completed *in absentia* with the permission of the department, curriculum advisor or committee concerned.

Master's Comprehensive Examination

In addition to individual course examinations the candidate must pass a general written Master's Comprehensive Examination. In writing the examination the student is expected to correlate what has been learned

in coursework and reading in the literature of the selected fields. The examination normally requires from seven to nine hours writing time. Sections broadly cover the various fields which the candidate has selected for specialization.

The examinations are scheduled three times a year, in late November or early December, April and August, and should be taken during the last semester of course registration or shortly after completion of the prescribed course work. The student must have completed or be registered for all core requirements before being eligible to take the examination. If there is a lapse of time between completion of course work and the taking of the examination, the student must maintain continuous registration and must be registered for the semester or summer session in which the examination is taken.

The candidate should consult with an advisor, well in advance, as to the dates of the examination and the definition of the subject-matter fields which the examination is to cover. Application to take the examination is made at registration for the semester in which the examination is scheduled. Before applying for the examination, the student must have completed all of the courses in the program or be enrolled in the last semester and must have achieved a 3.00 *(B)* average. After applying for the Examination, a candidate may withdraw only by written notice to the department chairman.

A candidate who fails the examination may, with specific approval of the advisor and the dean, repeat the examination, but only after the lapse of one semester and the undertaking of additional preparation as prescribed. If the candidate fails a second time, no further opportunity to take the examination will be permitted.

SCHOLARSHIP REQUIREMENTS

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; and *CR*, Credit.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be counter-balanced by a grade of *A* in a graduate course of equal status.

A student whose quality-point index falls below 3.00 after completing a minimum of 12 semester hours of graduate study will be placed on probation. This probation extends through the period in which the student next attempts 12 semester hours of graduate work, including prescribed courses. During this period the student's performance will be monitored to determine suitability for continued graduate study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of *F* is required to present cause, for consideration by the Dean, as to why continued study should be permitted.

SUSPENSION

A graduate student who does not meet the conditions of probation (see above) will be suspended or asked to withdraw. A student who is sus

pended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence which indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of graduate study. Should the student fail to achieve this minimum quality-point index a second suspension will result and subsequent readmission will be denied.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 46.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the Dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

Required Courses in Administration (Certain Fields)

The following courses in general administrative theory and practice are required of all candidates for the degree of Master of Business Administration.

		Semester Hours
Mgt 201:	Advanced Administrative Management	3
*Mgt 204:	Quantitative Factors in Administration	3
Mgt 207:	Human Behavior in Organizations	3

In addition, each student is normally required to take, from the following group, the course appropriate to the selected area of concentration:

Acct 276:	Management Planning and Control	3
BAd 257:	Business Policy in the Multinational Firm	3
BAd 297:	Business Policy Formulation	3
HCA 206:	Case Studies in Health Care Administration	3
Mgt 263:	Case Studies and Field Research in GEMSOC	3

The Thesis

Students contemplating doctoral study are strongly urged to include the thesis as a part of their master's program. The thesis subject should be selected as early as possible so as to permit effective integration with the course work.

*Mgt 204 is waived for students who select a concentration in Quantitative Analysis for Decision-making.

The subject must be approved by the professor in charge of the student's field. The thesis in its final form must have the approval of the professor in charge and must be presented to the Dean by the student no later than the date announced in the calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the Dean.

Payment of tuition for the thesis entitles the candidate, during the two semesters in which registered for thesis (299–300), to the advice and direction of the member of the Faculty under whom the thesis is to be written. In case a thesis is unfinished, an additional successive academic year is granted without further tuition payment. The student must, however, maintain continuous registration during this period. If the preparation of the thesis extends more than three semesters beyond the date registered for thesis 300, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

Optional Master's Program Without a Thesis

A thesis is required in certain degree programs and optional in others. In those programs where a thesis is optional and the student elects not to write one, the student must take a course in research methodology and one other elective.

MASTER OF BUSINESS ADMINISTRATION

Except for the field of concentration in accounting*, curricula leading to the professional degree of Master of Business Administration include the following:

1. *The recognized Common Body of Knowledge in business administration.*
   This may be fulfilled by waiver for prior work completed or by completing the courses listed below with a QPI or 3.00 or higher. A student with an undergraduate degree in business administration from an institution accredited by the American Assembly of Collegiate Schools of Business is regarded as having completed the Common Body of Knowledge.

	Semester Hours
The Common Body of Knowledge Courses	
Acct 1–2, or 115 and 193; BAd 131, 141, 161, and 181; Econ 1–2 or 217–18; Mgt 203; and Stat 51 or 111 or equivalent	30
2. *Required Courses in Administration*	
Mgt 201, 204, and 207	9
One policy course, as appropriate, selected from BAd 257, 297; HCA 206; or Mgt 263	3
3. *Field of Concentration* (see pages 147–51)	
Twelve semester hours of course work, planned and scheduled with the student's academic advisor	12

* For the curriculum leading to the degree of Master of Business Administration with a field of concentration in Accounting, see pages 196-97.

4. ***Research Requirement***
   Students electing to write a thesis will complete the appropriate thesis course (299-300); those not electing to write a thesis will complete one of the appropriate courses selected from BAd 295, Mgt 295, PAd 295, Acct 295, HCA 207 or UR&P 295, plus one three-semester-hour elective 6
5. ***Electives*** 0–6

All students must complete a minimum of 36 semester hours of graduate coursework. A maximum of one-quarter of the semester hours of graduate coursework required for a degree may be approved for transfer to the School of Government and Business Administration from the College of General Studies, the Division of University Students, another degree-granting division of this University, or another accredited college or university under the following conditions: the coursework must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be graduate-level coursework, it must have been taken within the past two years and the student must have received a grade of *B* or better. This action must be approved by a petition to the advisor and the Dean. A transcript of the coursework must be on file before the petition can be considered.

Fields of Concentration

Students select a minimum of 12 semester hours from one of the following fields of concentration.

ACCOUNTING

This field provides a contemporary, broad-based academic preparation which will apply equally to the fields of accounting in government, industry, and public practice, as well as to the field of general administration employing accounting as an effective means of understanding the organization. (See pages 196–97 for program of study.)

ADMINISTRATION OF SCIENCE AND TECHNOLOGY

This field explores the many aspects of technology relating to and influencing research and development management, business, and public policy. The employment of "state-of-the-art" technology and the creation of new technology through research and development are important processes in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The concentration has been designed to identify and study the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

APPLIED ECONOMICS

This field covers economic institutions and analytical methods from the viewpoint of business or governmental management. Its purpose is to develop (1) a broad understanding of the tools of economics; (2) an analytical power with respect to various facets of an organization's activity or multi-organizational areas of special interest; (3) a skill in problem-oriented applications of economic tools; (4) an ability to interpret historical development and predict future trends in firms, industries, and economies; (5) a familiarity with the institutional setting of economic activity; and (6) an appreciation of the economic reasoning behind public policies.

With a strong orientation to the economic problems of organizations, this field of concentration is based on the methodology of general economics which it supplements with the methods of management science.

Applied economics presumes skills in quantitative methods, statistics and intermediate-level general economics. It is offered in a sequence that commences with courses based on microeconomic and macroeconomic tools respectively.

BEHAVIORAL SCIENCES IN ORGANIZATION DEVELOPMENT

This program reflects the assumption that the effective utilization of the behavioral sciences is concerned with both means and ends; that the specialist in behavioral science not only is skilled in theory and research but also applies technical and specialized knowledge as a conscious force in effective organizational growth and improvement. Thus, courses are designed to equip the student with organizational concepts and behavioral skills appropriate to optimizing the utilization of a system's total resources.

This program is designed to fulfill the need for professionals capable of designing, creating, and developing the necessary behavioral and organizational systems appropriate to rapidly changing societies. Emphasis is on the interrelationships of such dimensions as motivation, leadership, problem-solving, organizational growth, and increased complexity of modern organizations and their effect upon the functions of organizational development.

BUSINESS-GOVERNMENT RELATIONS

This field provides a knowledge and understanding of the total business environment essential to business policy formulation and execution; gives a keener appreciation of the role and function of business in a free enterprise society, its environmental needs for optimum effectiveness, and what government can and should contribute to that environment; familiarizes students with successful techniques by which the content and direction of public policy toward business can legally be influenced; and provides students with a thorough knowledge of current government policies toward business, contemporary issues affecting government-business relations, and possible solutions to problems in this area.

This field is based on the premise that the enormous influence of government on business and vice-versa—exercised in the roles of regulator, cus

tomer, supplier, protector, and competitor—will become even more pervasive and that business policy formulation and execution and business decision-making will become increasingly dependent upon thorough knowledge and understanding of the total environment of business and, most importantly, of government policies, programs, and laws affecting business.

FINANCE AND INVESTMENTS

This field prepares students for careers in finance and investments, providing a background in business budgeting, controllership, treasury, long-range planning, reporting and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions. Instruction not only applies to manufacturing and trading enterprise but, in addition, includes railroad and public utility financing. Each, however, has distinctive operating features. Most financial dogmas have a universality that cuts across business lines, and variations are more a matter of degree than a form of substantive difference.

GENERAL MANAGEMENT SYSTEMS AND ORGANIZATIONAL CYBERNETICS

This field addresses the critical need for management to deal effectively with the fact that human institutions of all kinds tend to become larger and more complex as changes accelerate both socially and technologically. In many traditional academic fields general systems and cybernetic concepts have evolved as the interdisciplinary mode for understanding increasingly complex systems. This has profound relevance for the contemporary operating manager and policy-maker.

Because this program is essentially interdisciplinary and transcontextual in nature, the student is afforded an unusually broad range of opportunities to apply educational experience to managerial, organizational and societal problems. Professional and academic career potentials are available in the following fields: (1) research and teaching in the growing number of systems and cybernetics oriented programs now emerging in colleges and universities in the United States and elsewhere in the world; (2) institutional/environmental interface management or consulting; (3) system-focused organization development consulting or staff work; (4) corporate and government agency long-range (strategic) planning and control activities; and (5) advisory and staff positions and program directors in global agencies such as operating components of the United Nations, multinational corporations and foundations, and multi-governmental agencies such as OECD, as well as in the agencies and departments of national governments.

HEALTH CARE ADMINISTRATION

This program of study consists of both on-campus academic studies and off-campus field practice assignments. For further information see the description for the degree of Master of Arts in Health Care Administration on pages 154–55.

INFORMATION SYSTEMS TECHNOLOGY

This field is designed to provide a managerial understanding of the principles of manual, mechanical, and electronic information processing, including computer programming concepts, methods, and languages; an appreciation of the capabilities, limitations, and selection procedure of information processing equipment; a knowledge of all phases of management information systems development, implementation, and evaluation and an understanding of the roles of both management and systems personnel in information technology. It also provides an appreciation of the role of information systems technology as a tool of management.

Students participate in the development of management information systems; in the selection of computer equipment; and in the installation management, and evaluation of management information systems—during class sessions.

INTERNATIONAL BUSINESS

This field is designed to prepare students for careers in firms operating on a multinational basis or about to enter the international field; for careers in the federal government and in international agencies concerned with business, industry and finance abroad; and for the commerce option of the Foreign Service Officer Examination.

This program is also designed to provide foreign students with the background and skills necessary to promote international business, and to prepare them for careers in foreign and domestic firms within their own countries and for commercial officer positions within their governments.

Each student's program is individually developed by the student's adviser according to the student's background and interests.

MARKETING

This field is devoted to the development of professional marketing managers whose responsibilities may include planning and developing new products, services, and ideas; advertising, selling, and merchandising; and arranging distribution channel systems. Courses cover all aspects of the marketing management function. Foundation courses are *Marketing Management*, *Buyer Behavior*, and *Marketing Research*. Functional courses are *Promotion Management*, *Marketing Channels*, and *Marketing Strategy*. Specialized elective courses, *International Marketing*, *Marketing to the Government*, and *Marketing and Public Policy*, utilize the resources of the Washington metropolitan area.

PERSONNEL MANAGEMENT

This field is concerned with all aspects of the employment of human resources in business organizations. Career opportunities are open in domestic and international business organizations, hospitals, trade associations, research and educational institutions and local, state and

federal government agencies. Courses encompass all phases of the recruitment, selection, employment, and development of people, industrial relations, unionism, collective bargaining, labor relations and manpower utilization.

PROCUREMENT AND CONTRACTING

This field responds to the recognized need for greater professionalism and sophistication among those engaged in procurement activities of the federal government and in contracting activities of vendors to the federal government.

The sustained increase in federal purchasing—in volume, variety, and complexity—places ever greater demands upon the skill and resourcefulness of procurement and contracting personnel. The field has therefore been designed with the following objectives: (1) to provide a broad professional education in the knowledge and skills necessary for success in this field; (2) to develop in the student increased ability in analysis, decision-making, and communications; (3) to increase the student's appreciation of the economic, social, legal and technological considerations present in procurement and contracting activity.

QUANTITATIVE ANALYSIS FOR DECISION-MAKING

This field develops a thorough understanding of quantitative or mathematical approaches to problems of managerial control and decision-making. While the program will develop a competent background in basic mathematical theory associated with the various techniques, it is oriented toward applications of the techniques rather than their theoretical mathematical content.

TRANSPORTATION

This field is concerned with both private and public planning and with the management of a viable transport system which will best serve the needs of the nation and its industries within a competitive framework. Transportation is an integral function of all levels of government, as well as of every unit of industry throughout the nation.

MASTER OF PUBLIC ADMINISTRATION

Degree requirements for the Master of Public Administration degree include a minimum of 36 semester hours, at least 21 of which must be taken in the Department of Public Administration.

A maximum of one-quarter of the semester hours of graduate coursework required for the degree may be approved for transfer to the School of Government and Business Administration from the Division of University Students, another degree-granting division of this University, or another accredited college or university under the following conditions:

the coursework must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be graduate-level coursework, it must have been taken within the past two years and the student must have received a grade of *B* or better. This action must be approved by a petition to the advisor and the dean. A transcript of the coursework must be on file before the petition can be considered.

Students must successfully complete PAd 294 *Statistical Applications in Public Administration* and PAd 295 *Research Methods* (six semester hours) and five core courses (15 semester hours) which constitute a Common Body of Knowledge in public administration. These courses deal with the study and practice of public administration, public expenditure analysis, human behavior in organizations, public policy, and organization theory. In each of the latter two areas, students are to choose one of two courses either of which fill the core curriculum requirement. The Common Body of Knowledge encompassed by these courses is the basis of one of the two comprehensive examinations taken at the completion of the students' formal coursework.

Master of Public Administration candidates are required, in consultation with their advisors, to select one of 16 fields of concentration listed below. The field of concentration ordinarily requires three courses (nine hours), although in some cases an additional course is required. The field constitutes the basis for the student's second comprehensive examination (in addition to the public administration core examination).

Master of Public Administration degree candidates who do not have strong undergraduate backgrounds in public administration or political science, or who lack extensive experience in government service, are strongly urged to take one of three courses dealing with American administrative institutions: PAd 213 *Administration in the Federal Government*, PAd 245 *Intergovernmental Relations* or PAd 250 *Administration of State and Local Governments*.

The remainder of the 36 hour program consists of one or two elective courses chosen by the student with the advisor's approval. These electives may be outside the student's area of concentration. Students may also elect to write a master's thesis which would be counted as two elective courses (six hours).

Because the public service requires a wide variety of expertise, students with all undergraduate degree backgrounds are considered for admission. There are no prerequisites.

Required Courses

RESEARCH METHODOLOGY (6 hours)

1. PAd 294 Statistical Applications in Public Administration
2. PAd 295 Research Methods

PUBLIC ADMINISTRATION CORE (15 hours)

1. PAd 205 Introduction to Public Administration and Management
2. PAd 252 Public Expenditure Analysis and Planning

3. PAd 214 Policy Analysis in Public Administration *or*
   PAd 260 Policy Formulation and Administration
4. PAd 221 Organization Theory and the Public Sector *or*
   PAd 223 Behavioral Factors in Large and Complex Organizations
5. Mgt 207 Human Behavior in Organizations

AMERICAN ADMINISTRATIVE INSTITUTIONS (3 hours), one of the following is strongly recommended:

PAd 213 Administration in the Federal Government
PAd 245 Intergovernmental Relations
PAd 250 Administration of State and Local Governments

FIELD OF CONCENTRATION (9 hours, for most fields)

Behavioral Science
Budgeting and Finance
Business-Government Relations
Developmental Administration
Governmental Administration
Health Care Administration
Information Technology and Systems Management
International Trade
Manpower Management
Organization and Management
Policy Analysis and Evaluation
Public Personnel Administration
Quantitative Analysis for Decision-making
Research and Development Administration
Urban Administration
Urban and Regional Planning
Special field (approved by advisor)

ELECTIVES

One or two courses (three to six hours)

MASTER OF URBAN AND REGIONAL PLANNING

The program of graduate study in Urban and Regional Planning leads to the professional planning degree of Master of Urban and Regional Planning. It is designed as preparation for careers on the municipal, county, state, and national levels, and for private professional practice. The course of study is designed to provide a broad professional education, to develop competence in planning theory and methodology, and to emphasize the analytical ability and creativity necessary for solving urban and regional problems. Each student's program is designed in consultation with an assigned faculty advisor in accordance with individual career plans.

The degree is awarded by vote of the Faculty after satisfactory completion of (1) from 45 to 50 semester hours of course work, depending

upon the background and experience of each individual student, including a thesis equivalent to six semester hours (most students will ordinarily be required to take 50 semester hours); (2) a minimum of three months' full-time professional training in a planning agency under qualified supervision, with an acceptable written report to be submitted after completion of the training period; (3) a written Master's Comprehensive Examination; and (4) a thesis based on the candidate's research in the field of urban and regional planning.

MASTER OF ARTS IN HEALTH CARE ADMINISTRATION

The program of study leading to the degree of Master of Arts in Health Care Administration consists of a basic minimum two-year period of graduate study, normally including both on-campus academic studies and off-campus field practice assignments. The length of each period is dependent upon the study-in-depth concentration which the student elects. The majority of students begin their studies in the fall semester of each year. However, a limited number of qualified students may be admitted to begin their course work in the spring semester and summer sessions. The basic curriculum is developed in keeping with the background and professional goals of each student and ordinarily consists of a minimum of 48 semester hours. Undergraduate courses in accounting, economics and statistics are required as a prerequisite for all of the concentrations in this program.

Ordinarily full-time students can expect to complete the on-campus phase of the degree program in two to three semesters, and the administrative residency or field practice in one to two calendar years. The total time depends on past academic course work and experience in the health care field.

Fields of Concentration

Students will select one of the following concentrations: administration of long-term care facilities, health planning, health information systems or hospital administration.

ADMINISTRATION OF LONG-TERM CARE FACILITIES

This concentration is designed to prepare students for administration in such areas as nursing homes, facilities for the aged, mental hospitals and community health clinics.

During the first phase the student must complete a satisfactory academic program of course work, selected in accordance with the student's background and needs. These courses cover the general technical background of health care administration, general administrative theory and practice, and problem-solving in the management of extended care and long-term care patients.

The second phase is a period of field experience as an administrative resident under a qualified preceptor. A written major report or selected field project reports are required.

HEALTH PLANNING

This concentration is designed to prepare students to plan for and coordinate all aspects of private and public health care systems in accordance with sound management principles. It is an interdisciplinary program which includes courses from (1) health care administration; (2) health care planning; (3) supporting disciplines such as sociology, urban and regional planning, quantitative methods, and public administration; and (4) a particular area of concentration selected by the student to gain a specific skill.

In addition to the course work there are periods of supervised field experience. Written reports are required.

HEALTH INFORMATION SYSTEMS

This concentration recognizes the rapidly growing demand for individuals who can develop and implement the use of computer-based information systems in decision-making approaches. It is designed to prepare those who wish to supervise and coordinate data collection, processing and retrieval activities for health care complexes.

During the first phase the student must complete a satisfactory academic program of course work, selected in accordance with the student's background and needs. These courses cover the general and technical background of health care administration and general administrative theory and practice. In addition, students must complete required courses in computer services and information handling.

The second phase consists of supervised field experience, which includes written reports.

HOSPITAL ADMINISTRATION

This concentration is divided into two phases. During the first phase the student must complete a satisfactory academic program of course work, selected in accordance with the student's background and needs. These courses cover the general and technical background of health care administration, general administrative theory and practice, and problem-solving in management as it relates to short-term care hospitals.

The second phase is a period of field experience as an administrative resident under a qualified preceptor. A written major report or selected field project reports are required.

POST-MASTER'S GRADUATE CERTIFICATE IN HEALTH CARE ADMINISTRATION

Students with approved master's degrees from accredited institutions may take a special post-master's program leading to a Post-master's Graduate Certificate in Health Care Administration. Each program will be planned to meet the professional needs of the individual student, whether the student wishes to undertake a new field of study or to amplify knowledge of work done at the master's level.

DOCTORAL PROGRAMS

Study for the degree of Doctor of Business Administration and Doctor of Public Administration is supervised by the Committee on Doctoral Studies.

Admission

Applicants are expected to have adequate preparation for advanced study. A master's degree, preferably in a field appropriate to the proposed doctoral program, is evidence of such preparation, although, under special circumstances, applicants without a master's degree may be considered. Scores on the Graduate Record Examination or the Graduate Management Admission Test are required. However, applicants who have taken the Law School Admission Test or the Medical College Admission Test may submit these test scores for consideration. Under special circumstances scores on the Miller Analogies Test may also be submitted. Applicants whose test scores are more than 10 years old are encouraged, but not required, to take or retake the Graduate Record Examination or the Graduate Management Admission Test. Arrangements to take these tests must be made with the Educational Testing Service. Students whose native tongue is not English must also submit the Test of English as a Foreign Language (TOEFL) scores (see pages 25–27).

The Doctoral Committee does not use specific cutoff points for grade averages and test scores. It carefully reviews each applicant's entire record and makes its selection on a competitive basis in keeping with enrollment limitations.

This evaluation takes three to four weeks, after which the Admissions Office notifies each applicant, through the mail, of the Committee's decision. Completed applications must be sent to the Office of the Admissions Officer, School of Government and Business Administration, George Washington University, Washington, D.C. 20052, by March 1 for the fall semester and summer sessions, and by October 1 for the spring semester. Graduates of non-U.S. universities must apply by February 1 for the fall semester and summer sessions, and by September 1 for the spring semester.

Qualifying Requirements

After admission, students must qualify in Quantitative Methods and either Accounting or Computer Programming. The choice between accounting and computer programming must be approved by the student's program lead professor.

Qualifying requirements may be met through examination or course work. Qualifying examinations are given once each semester.

To satisfy the qualifying field requirements through coursework students are expected to register for the following and to obtain a grade of B or better in each course: Quantitative Methods: Mgt 203, 225 and 226. Accounting: for D.B.A. candidates, Acct 115, 215 and one course selected from Acct 262, 275, 276, 282 and 295; for D.P.A. candidates, the accounting requirement is determined individually, in consultation with the advisor; Computer Programming: Mgt 118, 119.

Plan of Study

The Administrative Theory and Practice and Applied Economics fields are required for the Doctor of Business Administration degree; the Administrative Theory and Practice and American Political Process and Public Administration fields are required for the Doctor of Public Administration degree. The chairperson of the Committee on Doctoral Studies, in consultation with the applicant, designates two elective fields of study. Elective fields may be chosen from such areas as Accounting, Behavioral Science in Organizations, General Management Systems and Organizational Cybernetics, Government-Business Relations, Health Care Administration, Information Technology, Quantitative Analysis for Decision-making, Research and Development: Policy and Management, and Urban and Regional Planning. Additional elective fields for D.B.A. candidates include Finance and Investments, International Business, Marketing, Personnel Management, and Materials and Operations Management; those for D.P.A. candidates are Administration in Metropolitan Areas, Applied Economics, Comparative and Developmental Administration, Public Financial Management and Budgeting, and Public Personnel Management. The exact content of a program is determined in light of the student's background and competence after consultation with the appropriate faculty member in each of the fields selected.

Full-time students are expected to register for nine to 12 semester hours, part-time students for six semester hours. All work for the doctor's degree must be completed in five years unless an extension of time is granted by the Committee on Doctoral Studies. All courses must be taken on campus. The required minimum grade point average is 3.25.

When the applicant has completed all courses, he or she takes the Comprehensive Examinations in the fields of study previously designated. Upon successful completion of the Comprehensive Examinations, the student advances to candidacy and may formulate and defend a dissertation proposal.

While writing the dissertation the candidate must register for a total of 24 hours of *Dissertation Research* (BAd 399 or PAd 399). Full-time students must register for nine to 12 hours a semester for two semesters, and for sufficient hours in the third semester to complete the 24-hour requirement. Part-time students must register for six semester hours a semester for four semesters. If the dissertation has not been completed during the time the student has registered for the required 24 hours, the students must register for three semester hours of *Dissertation Research* each succeeding semester until the dissertation and final oral examination are satisfactorily completed.

THE DISSERTATION

A dissertation is required as evidence of ability to perform scholarly research and to interpret and present its results.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract and services offered by University Microfilms, Inc., are available in the Office of the Committee on Doctoral Studies.

THE FINAL EXAMINATION

The final examination consists of an oral defense of the dissertation and is given by a committee appointed by the Committee on Doctoral Studies. Upon successful completion of this oral examination the candidate will be approved for the degree of Doctor of Business Administration or Doctor of Public Administration by the Committee.

Residence

The Committee on Doctoral Studies expects all students to remain registered until all degree requirements are satisfied. By failing to register for one semester or more, the student breaks registration and must apply for readmission to the School under whatever new conditions and regulations are set up by the Committee. The student who has completed tuition requirements, but whose graduation is deferred for any reason, must maintain continuous registration by paying the continuous registration fee each semester until graduated.

Between 1975 and 1977 the School is conducting an experimental doctoral program. A small, carefully selected group of students is permitted to meet D.B.A. and D.P.A. requirements by alternative methods under the guidance of a faculty advisor and with the approval of the Committee on Doctoral Studies.

For more detailed information on both the regular and the experimental doctoral program, see the *Handbook of the Doctoral Programs in Business and Public Administration*. It is available in Room 200 of the Hall of Government.

SPECIAL PROGRAMS

Government Intern Scholarship Program

The Government Intern Scholarship Program offers annually 50 scholarships to assist government agencies in training carefully selected young men and women for administrative leadership in government careers. Each scholarship provides a tuition-free course of three semester hours per semester, and interns who maintain satisfactory standing in both their academic program and their government training program may qualify for a second scholarship for one additional semester.

Continuing Education in Health Care Administration

A nondegree program is conducted, both on campus and off campus, in the various areas of health care administration whenever a sufficiently large class is organized. Institutes, workshops and lecture series are conducted under the auspices of program faculty and selected leaders from local, state, and regional areas on topics of current interest to the requesting organization. There is no specific prerequisite. Fees are to be announced.

International Institute for Health Care Administration

In recognition of special educational needs of students from other countries, the International Institute for Health Care Administration offers programs of instruction designed to meet these needs at either the degree or certificate level.

It is also equipped to enter into arrangements with principals of hospital systems in world-wide areas to assist in the preparation of teaching programs or the actual instruction of administrative personnel either abroad or at the University.

Combined Master's and Juris Doctor Degree Program

In certain instances arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a master's degree in some fields in the School of Government and Business Administration. Students must be admitted both to the National Law Center and, separately, to the School of Government and Business Administration and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Certification of Public Purchasing Agents

The School of Government and Business Administration participates in the National Institute of Governmental Purchasing professional certification program. Courses and examinations leading to qualification as "Certified Public Purchasing Officer" (CPPO) are provided. Inquiries may be directed to the School or to the National Institute of Governmental Purchasing, 1001 Connecticut Ave., N.W., Washington, D.C. 20036.

Bachelor of Science in Health Care Administration

A program of study leading to the degree of Bachelor of Science in Health Care Administration develops persons for beginning administrative and planning level positions in hospitals and related health organizations. At this time the degree program is limited to students in the Naval School of Hospital Administration in Bethesda, Md.

Off-Campus Degree Programs

The School of Government and Business Administration has academic jurisdiction over off-campus programs leading to the following degrees: Bachelor of Science in Administration with concentrations in accounting and business administration and the Master of Science in Administration. These degree programs are administered by the College of General Studies. For details concerning the off-campus programs see the *College of General Studies Bulletin*.

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Dean B.M. Sapin

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† The Dean of the School is an *ex officio* member of all committees.

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R.L. Cole, D. Fischer, K.J. Langran, G.C. Mackenzie, J.M. Starrels

INTRODUCTION

With the establishment in 1898 of the School of Comparative Jurisprudence and Diplomacy, the study of government was first organized as a separate entity in the University. In 1928, this School was reorganized and broadened as the School of Government. During the next two decades, programs in business administration and public administration were added, and the emphasis gradually shifted from undergraduate to graduate study. The name was changed in 1960 to the School of Government, Business, and International Affairs to reflect more accurately the offerings of the School. A division of the School was effected in 1966, and two schools were established—the School of Government and Business Administration, a primarily professionally oriented school, and the School of Public and International Affairs, a primarily policy-oriented school.

Programs of the School of Public and International Affairs are interdisciplinary, and emphasize both domestic and foreign governmental policy.

Students in the freshman and sophomore years are registered in Columbian College of Arts and Sciences, the liberal arts college of the University, and are assigned special advisors from the School of Public and International Affairs to assist them in planning their programs.

Academic Programs

Programs available within the School of Public and International Affairs are undergraduate fields in Chinese Language and Literature, East Asian Studies (China and Japan), and Urban Affairs; undergraduate and graduate fields in International Affairs and Public Affairs; and graduate fields in East Asian Studies, Latin American Studies, Russian Studies, and Science, Technology, and Public Policy. Special programs in Soviet, Far Eastern and East European studies are offered by the School's Institute for Sino-Soviet Studies.

Objectives

Four undergraduate programs of study—East Asian Studies, International Affairs, Public Affairs and Urban Affairs—are aimed at preparing the student to understand major contemporary issues in international affairs or in domestic public affairs. The programs are designed not to produce narrow professional specialists, but to foster a liberal education, interdisciplinary in nature and broader than a concentration in one of the conventional disciplines. In each program there is double effort: to develop a background as broad and as deep as possible in order to assist in the

understanding and analysis of modern problems and to give instruction in some useful tools of analysis. The program in Chinese language and literature is closer to the traditional liberal arts pattern, emphasizing language and culture.

The graduate programs leading to the degree of Master of Arts are more concentrated. The student is expected to develop a greater competence in an area or a discipline, building on the student's undergraduate program in preparation for professional employment in government, in international organizations, in business, or in private agencies concerned with public or international affairs.

REGULATIONS

Regulations concerning admission, registration, fees, and finances are stated on pages 20–33; other University regulations, on pages 44–53.

Attendance

Students may not attend classes until registration is completed and fees due are paid.

Students are held responsible for all the work of the courses in which registered, and all absences must be excused by the instructor before provision is made to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.

Withdrawal

Withdrawal after the end of the fifth week of classes (fall or spring semester) without academic penalty is permitted only in exceptional cases (see "Withdrawal," page 47).

THE DEGREE OF BACHELOR OF ARTS

The School offers programs leading to the degree of Bachelor of Arts in the fields of Chinese Language and Literature, East Asian Studies (China and Japan), International Affairs, Public Affairs and Urban Affairs.

ENTRANCE REQUIREMENTS

The satisfactory completion of the Chinese Language and Literature, East Asian Studies, International Affairs, Public Affairs or Urban Affairs curriculum in Columbian College of Arts and Sciences (see pages 77–79), or the equivalent, is required.

GENERAL REQUIREMENTS FOR THE DEGREE

The following requirements apply to both the standard 120-semester-hour

and the special 90-semester-hour programs. See pages 165–66 for additional requirements for the 90-semester-hour program.

Academic Work Load

Normal academic work load for the full-time student is 15 semester hours. A student with a strong academic record may take up to 18 semester hours with the approval of the Dean.

Scholarship Requirements

In order to graduate, a student must have the following: (1) 120 semester hours (or 90 semester hours if the student qualifies for the special 90-semester-hour program) of passing grades (courses in human kinetics and leisure studies cannot be included in the required hours); and (2) grades of *A* or *B* in four three-semester-hour courses in the major, to be taken in residence at George Washington University. The major includes the required second-group courses (101-200) and courses taken in the group options.

DEAN'S HONOR LIST

The name of every student who attains a 3.50 quality-point index* in course work is placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to be in good standing.

The rules below govern probation and suspension and are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester or the three summer sessions. For students taking less than 12 semester hours in any one semester or summer session, these rules are applied on the basis of 12 or more hours taken during two or more semesters or summer sessions.

PROBATION

Students who in one semester receive two grades of *F*† in courses carrying three or more semester hours of credit each, or the equivalent, are placed on probation. Those on probation who receive one grade of *F*† in such a

* See page 48 for explanation of the quality-point index

† In determining whether a student is placed on probation or suspension, two grades of *D* are equated with one grade of *F*. Thus, for example, a student who receives one grade of *F* and two grades of *D* is placed on probation, and a student who receives two grades of *F* and two grades of *D* is suspended.

course will be continued on probation for a second semester. Those on probation taking 12 or more semester hours whose grades are all *C* or better are removed from probation.

SUSPENSION

The following three cases constitute ground for suspension: (1) three grades of *F** in courses carrying three or more semester hours of credit or the equivalent; (2) two grades of *F* when on probation; (3) one grade of *F* when in a second semester of probation.

Students who are suspended for poor scholarship may apply for readmission after the lapse of one fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. Students readmitted after suspension are on probation. Those who are still on probation after completing 24 credit hours, will be suspended. A student suspended twice for poor scholarship will not be readmitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 46.

Removing an Incomplete.—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Public and International Affairs. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Public and International Affairs.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfac-

* In determining whether a student is placed on probation or suspension, two grades of *D* are equated with one grade of *F*. Thus, for example, a student who receives one grade of *F* and two grades of *D* is placed on probation, and a student who receives two grades of *F* and two grades of *D* is suspended.

ory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the dean.

Study Abroad

Students wishing to study abroad must consult with their advisors and the dean, because arrangements must be made on an individual basis. Students should receive the dean's approval, in advance, for their plan of study abroad if they plan to have the credits earned abroad apply to the degree program in which they are registered. A catalogue or other description of the foreign institution or study program should be presented for consideration together with detailed descriptions of the courses to be taken. Students of international affairs are encouraged to travel and study abroad.

Credit/No Credit Option

A student in the School of Public and International Affairs who has a cumulative quality-point index* of 2.5 or better may, with the approval of the advisor and the dean, take one course each semester and receive a grade of *CR*, Credit, or *NC*, No Credit, which will be recorded on the student's transcript but will not be reflected in the cumulative grade average. A student must sign up for such an option at registration. Under no circumstances may a student change from credit no credit status to graded status, or vice versa, after the end of registration. Courses in the student's major (except those in which the grade of *CR* or *NC* is normally assigned) may not be taken on a credit no credit basis. A transfer student may not elect to take a course on a credit no credit basis until the second semester of enrollment in the University. Students in the School of Public and International Affairs may take no more than six courses in which the grade of *CR* or *NC* is assigned, including those in which the grade of *CR* or *NC* is normally given and those taken in any other college, school, or division of the University prior to transferring to the School of Public and International Affairs.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree.

Additional Requirements for the 90-Semester-Hour Program

Exceptional students may, when registered as freshmen or sophomores in Columbian College of Arts and Sciences, petition the dean of the School of Public and International Affairs for admission to a special 90-semester-hour degree program in the School of Public and International Affairs. Supporting evidence in the form of achievement test scores, College-Level Examination Placement (CLEP) scores, and grades earned at George

* See page 46 for explanation of the quality-point index.

Washington University or any other institution must be supplied. The dean, in consultation with the Dean's Council, will determine eligibility for admission to the program, which takes place when the student enters the School of Public and International Affairs at the beginning of the junior year.

In addition to the general requirements (see pages 162–66) and the curriculum requirements (see pages 166–69), students in the 90-semester-hour program must fulfill the following requirements.

1. The student must receive grades of *A* in 50 percent of the total course work, and also in 50 percent of the courses required in the major.

2. The student must take at least 60 semester hours in courses beyond the first-group level (numbered above 100).

3. The 90 semester hours of credit must be earned in actual course work, i.e., credit through advanced placement, special examinations, etc., may not be counted in the 90 semester hours required for graduation.

Students who qualify for admission to the 90-semester-hour program are encouraged to begin taking second-group courses (numbered 101–200) as soon as they are qualified to do so, and should seek to obtain a waiver of course prerequisites in those disciplines in which they have a strong background.

CURRICULUM REQUIREMENTS

To be recommended by the faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work (see pages 77–79), a minimum of 60 semester hours during the junior and senior years, as set forth in one of the following curricula.

Earning Credit or Waiving Requirements by Examination

For information on earning credit or waiving curriculum requirements, see Columbian College of Arts and Sciences, pages 75–76.

Major Fields of Study

Requirements for the five major fields of study leading to the degree of Bachelor of Arts are listed below. Students should consult the appropriate department in the "Courses of Instruction" section of this catalogue for complete course descriptions.

CHINESE LANGUAGE AND LITERATURE

Prerequisite.—A minimum of 60 semester hours in Columbian College (see pages 77–78), or the equivalent from another accredited institution.

Requirements for the Major.—Chin 11–12, 109–10, and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Students in the Chinese language and literature program may study abroad in the junior year.

EAST ASIAN STUDIES (China and Japan)

The major in East Asian Studies is designed to introduce the student to a non-Western culture and to provide an understanding of the history, politics, and economy of modern China or Japan. The major is interdepartmental and is recommended for students who wish a comprehensive study of one of the world's major civilizations and for those who contemplate graduate study in Chinese, Japanese, or Far Eastern affairs.

A junior year abroad is available in this program of study for those interested in China. Students should contact the chairman of the Department of East Asian Languages and Literatures.

Prerequisite—The East Asian Studies curriculum, page 78, including Chin 5–6 or Japn 3–4.

Requirements for the Major—(1) Chin 11 (China focus) or minimum of three additional hours of Japanese (Japan focus), and Chin 163 or 164; (2) Econ 169 (China focus) or 170 (Japan focus); (3) three semester hours selected from Geog 125, 126, 127, 132, 146, or 164; (4) nine hours selected from Hist 138, 187, 188, 189, 195, 196 (either Hist 187 or 196, but not both, may be selected); selection covering both pre-modern and modern periods encouraged; (5) three hours selected from PSc 173, 197, 198, or 199; (6) nine semester hours of course work in economics, history, or political science *not related* to China or Japan, to be selected in consultation with and approved by the advisor; six semester hours in research and writing seminar related to China or Japan and taken in discipline of concentration.

INTERNATIONAL AFFAIRS

The major in International Affairs enables the student to specialize in international political relations, international economics, international communications, or regional studies.

Prerequisite—The international affairs curriculum, page 78.

Requirements for the Major—(1) Econ 181–82; (2) six semester hours of a third year of foreign language (may be a literature course taught in the language); (3) three semester hours selected from Geog 125, 126, 127, 132, 135, 146, or 161; (4) Hist 150 or 157, and 182; (5) PSc 140 and 142 or 144; (6) 15 semester hours from one of the group options listed below:

Group I. International politics—courses concerned with theory and practice in international affairs, forces shaping the world scene, and American foreign policy, selected from Geog 125, 126, 127, 139, 146 (if not elected to satisfy the major requirement); Hist 138, 139–40, 149; PSc 105–6, 107, 108, 121, 130, 131, 146, 178, 182, 198 (PSc 142 or 144 may be elected if not taken to satisfy the major requirement).

Group II. International economics—courses concerned with the world economy and American policy and practice in international trade and finance, selected from BAd 176, 178; Econ 101, 102, 104, 121, 122, 134, 147; Geog 125, 126, 127, 135; Stat 111, 112.

Group III. International communications—courses concerned with the

study of international information programs, public opinion, psychological warfare, cultural relations and public relations, selected from Anth 150, 153, 157, 161, 162; Geog 106, 125; Jour 145, 146; PSc 120, 146; Psyc 115, 151, 156; Soc 144.

Group IV. Regional study—a concentration in one of the following areas: (1) Africa—courses selected from Anth 178, 179; PSc 180, 181, 182; (2) Europe—courses selected from Econ 147; Hist 128–29, 131–32, 141–42, 147, 149, 151–52, 158; PSc 105–6, 130, 131; (3) Far East—courses selected from Anth 173, 174, 175; Chin 163–64; Econ 169; Geog 164; Hist 138, 187, 188, 195–96; PSc 105, 173; (4) Latin America—courses selected from Anth 170, 172, 185; Econ 185; Geog 161; Hist 163–64, 166; PSc 183, 184; interdisciplinary seminar 287 (PSc 285) offered by six departments participating in the Latin American Studies program; (5) Middle East—courses selected from Anth 177; Hist 158, 193, 194; PSc 177, 178, 179, 180; Rel 161; or (6) Soviet Union and Eastern Europe—courses selected from Econ 133, 134; Hist 138, 143, 145, 146, 188; PSc 108, 131 or 165, 168; Slav 161–62, 165, 166, 193–94.

PUBLIC AFFAIRS

The major in Public Affairs deals with domestic government and policy.

Prerequisite—The Public Affairs curriculum, pages 78–79.

Requirements for the Major—(1) Econ 101, 161, 162; (2) Hist 175–76; (3) PSc 114 or 115, 116 or 117, 119; (4) 12 semester hours from one of the group options listed below:

Group I. Economics—courses selected from Econ 102, 104, 121, 122, 123, 136, 142, 165, 181–82.

Group II. Politics—courses selected from PSc 106, 110, 111, 112, 116 (if not taken as a major requirement), 118, 120, 121, 122, 146.

Group III. Urban affairs—courses selected from BAd 174; Econ 157; Geog 140, 141, 142; PSc 111, 112; Soc 126; U&RP 153.

URBAN AFFAIRS

The major in Urban Affairs introduces students to the problems and issues of urban America and develops some of the practical skills necessary for dealing with actual decision-making situations in urban-related occupations. Emphasis is on urban public policy—the forces and processes that shape it and its adequacy in terms of current and anticipated needs.

The student may specialize either in the political and administrative aspects of the policy-making process, or in the analysis and evaluation of specific policy areas. An advisor works closely with each student to develop a program suited to personal interests and objectives. In the senior year, the student serves an internship in an urban-related agency or research organization and also attends a weekly seminar in which the work experience is related to a body of academic literature.

Prerequisite—The Urban affairs curriculum, page 79.

Requirements for the Major—(1) Introduction to Urban Affairs: Econ 157 and one additional three-semester-hour course in economics; Geog 140; PSc 104, 112;

117; Hist 186; plus two courses selected from Hum 40, 51–52; Soc 126 (waiver of Soc 1 requires permission of the instructor); (2) Urban research methods: Stat 53 and PSc 108; plus one course selected from Stat 97, 105, 117, 118, 123; Acct 1 2; (3) Specialized topics: three courses selected from BAd 174, Econ 136, 162, 165, 243; Geog 141, 142, 143; PAd 246, 249, 250, Soc 223; U&RP 153, 201 (special arrangements necessary to take graduate courses in public administration or urban and regional planning); (4) Senior internship and seminar: PSc 188 and 193—the grade of *CR* (Credit) or *NC* (No Credit) will be given for PSc 188. A student may elect to fulfill the internship requirement in a paid position in lieu of registering for PSc 188; however, the student must substitute six semester hours of elective course work.

Because they participate in the senior apprenticeship and seminar, majors in urban affairs may not select courses in the Service-Learning Program.

THE DEGREE OF MASTER OF ARTS

This School offers programs leading to the degree of Master of Arts in the major fields of East Asian Studies, International Affairs; Latin American Studies; Public Affairs; Russian Studies; and Science, Technology, and Public Policy.

ADMISSION REQUIREMENTS

Application forms are available from the Graduate Admissions Office, School of Public and International Affairs, George Washington University, Washington, D.C. 20052.

A bachelor's degree from an accredited college or university, with a *B* average or better, or the equivalent, in the relevant undergraduate major, is normally required. If there is evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of *B* will be given serious consideration. Scores on the Aptitude Test of the Graduate Record Examinations as well as letters of recommendation are required.

In East Asian Studies—An undergraduate major in a pertinent field is required. For the concentration in Chinese language and literature, the undergraduate program should have included 24 semester hours of Chinese language study.

In International Affairs—The applicant's undergraduate program should include background courses corresponding to the interdepartmental undergraduate major in international affairs at this University (see pages 167–68), or some other relevant social science program. In the case of major deficiencies in the social sciences or international relations, additional course work may be specified beyond the minimum requirements for the master's degree. The student's particular responsibilities will be indicated in the letter of admission to the program and in the course of subsequent consultation with an assigned faculty advisor.

In Latin American Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Latin American Studies at this University (see pages 359–60) or equivalent. Majors in other fields may be considered for admission pro-

vided their undergraduate course work includes Spanish or Portuguese and sufficient course work in three of the following six areas: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

In Public Affairs—An undergraduate major in public affairs, economics, history, or political science, depending upon the field of specialization in the master's program, is required. Students entering the program are assumed to have had some college-level course work in American government and politics, American history, and economic theory. To the extent that a student lacks such a background, the student must, in consultation with an advisor, undertake the appropriate remedial course work, including some courses which may be taken for graduate credit.

In Russian Studies—An undergraduate major in a pertinent field is required. The undergraduate program should have included the following courses, or equivalent: Hist 145, 146; PSc 131; Slav 1–2 and 3–4, or 5–6.

In Science, Technology, and Public Policy—Undergraduate majors in a social, life, or physical science, or in engineering are eligible for admission, although those lacking adequate preparation in relevant social sciences, particularly economics, may be required to take additional courses; such requirements will be indicated in the letter of admission to the program.

Readmission

A graduate student who has not maintained continuous registration and has not registered for one or more semesters must file an application for readmission the semester before planning to return to school. Applications for readmission are reviewed by the dean and the Committee on Admission.

GENERAL REQUIREMENTS

There are two options available in all fields leading to the Master of Arts degree. One requires a minimum of 24 semester hours of approved graduate work plus the successful completion of a thesis; the student must register for six semester hours of *Thesis Research* (299-300). The second option requires a minimum of 36 semester hours of graduate coursework and does not include a thesis. The coursework for both options is taken in preparation for the Master's Comprehensive Examination.

Candidates for the degree of Master of Arts are required to submit an advisor-approved "Program of Studies" (comprehensive fields, supporting course work, tool requirement, etc.) to the office of the dean by the end of the first semester in residence.

Master's degrees are awarded by vote of the Faculty after the student has completed the required course work and an acceptable thesis (if one is elected), has satisfied the foreign language or tool requirement, and has passed the Master's Comprehensive Examination.

Under special circumstances second-group courses (numbered 101-200) may be counted toward the master's degree when registration for graduate credit has been approved at the beginning of the course by the curriculum advisor, the instructor and the dean. The student who takes an undergraduate course for graduate credit is expected, by arrangement with the instructor, to do work at the graduate level in addition to the regular

work of the course. Normally, no more than six semester hours of second-group courses may be taken for graduate credit in the 30-semester-hour program, and no more than nine semester hours may be taken for graduate credit in the 36-semester-hour program. (The one exception to this rule is the case of students who select one or more fields in history; they may take nine hours of second-group courses in the 30-hour program and 12 in the 36-hour program.) No work counted toward a bachelor's degree may also be counted toward a master's degree.

All work for a master's degree must be completed in five years, unless an extension of time is granted by the dean. A student who is temporarily unable to continue the program of studies may request a leave of absence not to exceed one year.

No credit is granted for work done *in absentia* or without formal instruction, except for the thesis, which may be completed *in absentia* with the permission of the curriculum advisor and the dean. No more than six semester hours of graduate credit may be transferred from other accredited institutions or another division of the University, and these may be accepted only under limited conditions of time, grades, and relevance to the student's program.

A student who expects to continue studies for the degree of Doctor of Philosophy in the field of International Relations after receiving the master's degree in the field of International Affairs is strongly advised to plan from the beginning so that work for the lower degree will fit into a subsequent doctoral program in the Graduate School of Arts and Sciences (see pages 89–93, 97–99).

Tool Requirements

In most programs of study a candidate for the degree of Master of Arts must demonstrate a reading knowledge (certified by the appropriate language department) of at least one modern foreign language, to be approved by the dean. A master's degree candidate whose native language is not English may not select the native language to meet the tool requirement; the candidate may select English to fulfill the requirement with the approval of the advisor and the dean. The examination, which will test high-level reading and writing proficiency, is administered by the English for International Students program.

Candidates in the field of Public Affairs and in the field of Science, Technology, and Public Policy may substitute statistics for a foreign language. This requirement may be met by demonstration of proficiency at the level of Stat 105, 112 or 197.

Candidates in the field of International Affairs may petition the dean to substitute statistics for a foreign language. The primary basis for approving such petitions will be the relevance of the statistical skills to the student's thesis research.

The language or tool examination should normally be taken before the student has completed the first 15 hours of work. No student may take the examination more than three times.

Courses taken to fulfill the tool requirement are not counted in the semester-hour requirement for a master's degree.

Master's Comprehensive Examination

In addition to any course examinations, the candidate must pass a written Master's Comprehensive Examination. Examinations are scheduled twice a year (usually in November and April), and should be taken during the last semester of course registration or shortly after the completion of the prescribed coursework. If there is a lapse of time between completion of coursework and the examination, the student must maintain continuous registration during this period. The candidate must consult with the advisor, well in advance, as to the date of the examination and the definition of the subject-matter fields which this examination is to cover. It should be understood, however, that coursework constitutes only partial preparation for the Master's Comprehensive Examination. Each student is also expected to pursue a program of additional reading in each of the selected fields, in accordance with the advice of the faculty member responsible for instruction in that field. An oral examination on the thesis or major report may also be required.

Scholarship Requirements

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; and *CR*, Credit.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be counterbalanced by a grade of *A* in a graduate course of equal status.

A master's candidate who receives a grade of *F* is required to present cause for consideration by the Dean's Council as to why the student should be allowed to continue in the program of studies.

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. Except for thesis research courses, an "Incomplete" cannot be made up after the lapse of one calendar year. An "Incomplete" which is not removed by the end of one calendar year remains as a grade of *I* on the student's record. An "Incomplete" cannot be removed by reregistering for the course.

The Thesis

The thesis subject should be selected as early as possible so as to permit effective integration with the coursework.

The subject must be approved by the student's advisor and the member of the Faculty under whom the thesis is to be written. The thesis in its final form must have the approval of the thesis director and one other reader, and two copies must be presented to the dean by the student no later than the date announced in the Calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis entitles the candidate, during the period of registration, to the advice and direction of the thesis director and the other reader. In case a thesis is unfinished, an additional calendar year

may be granted without further tuition payment. The student must, however, maintain continuous registration (see page 49) during this period. If the preparation of the thesis extends beyond the additional calendar year, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

Fields of Study

Specific requirements for each of the six fields of study leading to the degree of Master of Arts are listed below. For prerequisites, see "Admission Requirements," pages 169–70.

EAST ASIAN STUDIES

The Master of Arts in East Asian Studies is an interdisciplinary program which includes coursework from at least four of the following disciplines: Chinese language and literature, economics, geography, history, and political science.

The degree program consists of 30 semester hours of coursework, including six hours of thesis research, or 36 semester hours of coursework without a thesis. Each candidate must pass a Master's Comprehensive Examination in one major and one or two minor fields. To fulfill the tool requirement candidates must demonstrate proficiency in either Chinese or Japanese language; with the permission of the dean, another East Asian language may be substituted. (As preparation for this requirement, a special Chinese language course will be available to students in the program.)

Only the 30-semester-hour thesis option is available to students selecting a concentration in Chinese language and literature. That program includes 12 semester hours of Chinese language and literature, six hours of history, six hours of electives selected in consultation with the advisor, and six hours of thesis research.

INTERNATIONAL AFFAIRS

The interdisciplinary program leading to the degree of Master of Arts in the field of International Affairs provides the student with a wide choice of fields within three broad areas of study: general, supplemental or special, and regional. Graduate courses in anthropology, business administration, economics, geography and regional science, history, political science, psychology and sociology relate to these fields, which are listed below:

General Fields of Study—International politics, comparative government and politics, modern political theory (including socialist and communist theory) and international economics.

Supplementary or Special Fields—International law; international organization and administration; international economic development; international communications; international and comparative aspects of communism; U.S. diplomatic history; U.S. foreign policy; science, technology, and public policy; 20th century British defense and foreign policy; and U.S. national security policy.

Regional Fields—Modern history, or government and politics, or economic history and problems of one of the following: Western Europe, Eastern Europe, the Soviet Union, Latin America, the Middle East, Africa, South and Southeast Asia and China. Within each geographical area there are normally three fields of study available.

Each degree candidate must select at least one general field. The fields should also represent at least two disciplines. Beyond these limits, the student is free to select any of the fields indicated above as long as they comprise a coherent program. Courses should be chosen with a view to their relevance to the selected fields. Candidates will be examined on their selected fields of study in the Master's Comprehensive Examination (see page 172).

Candidates who elect to write a thesis must choose *three* of the listed fields and take, in addition to the thesis, a minimum of 24 semester hours of graduate coursework in at least two departments, with no more than 15 hours in any one department.

Candidates electing a program without a thesis must choose *four* fields and may take no more than 21 of their required 36 semester hours in one department. They must also include in their program at least two research seminars (six semester hours) requiring the preparation of substantial research papers.

LATIN AMERICAN STUDIES

The program leading to the degree of Master of Arts in the field of Latin American Studies is designed to provide the student with an appropriate area background in three or four of the following fields: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

All degree candidates must complete 12 semester hours of graduate work, including the interdisciplinary seminar (287), in a major field selected from those listed above, and six semester hours in each of two minor fields selected from those listed above. Students who elect not to write a thesis, must take six semester hours in a third minor field selected from those listed above, or from the fields of urban and regional planning, economic development or population studies. The student must further complete an additional six semester hours in any of the major or minor fields selected. The tool requirement (see page 171) must be satisfied by demonstration of proficiency in Spanish or Portuguese, or in English if the student's native language is Spanish or Portuguese. The Master's Comprehensive Examination (see page 172) will cover all the student's selected fields.

PUBLIC AFFAIRS

The program leading to the degree of Master of Arts in the field of Public Affairs allows the student to specialize in either domestic economics or domestic politics. The student may select courses in consultation with an advisor to emphasize either political science, economics, or American history, provided (1) that no more than 15 hours of courses are elected

in one department under the 24-hour plus a thesis program, or (2) that no more than 21 hours are elected in one department under the 36-hour program without a thesis. Course work may include economics (public finance, monetary theory and policy, labor economics, industrial organization, natural resources and environmental economics, regional and urban economics, economic policy); history (U.S. political history, U.S. economic history, recent U.S. history); political science (domestic politics and government, Congress and the presidency, U.S. constitutional law and politics, state and urban politics, political science research methods, and science, technology, and public policy).

RUSSIAN STUDIES

This degree program is designed to give the student a broad grasp of Russian affairs on an interdisciplinary basis, with emphasis on the Soviet era. At the same time, the program provides an opportunity for students to gain knowledge of a special area of interest within the subject matter as a whole.

Required for the degree: 30 semester hours including a thesis, or 36 semester hours without a thesis. Each candidate prepares for a Master's Comprehensive Examination covering a required basic field. Each candidate will prepare an interdisciplinary program in one major and two minor fields chosen from the areas of internal affairs, foreign relations, political thought and theory, literature and culture, and economics and geography.

SCIENCE, TECHNOLOGY, AND PUBLIC POLICY

The program leading to the degree of Master of Arts in the field of science, technology, and public policy is flexible and is carefully planned and conducted in consultation with an advisor. All degree candidates are required to take 12 semester hours in the core field of science, technology, and public policy, which includes coursework both in science policy and in policy analysis. A second field must be chosen from one currently offered in the international affairs or public affairs programs of the School. Students who elect to write a thesis must select one additional field, and those who elect not to write a thesis must select two additional fields. The third and fourth fields may also be chosen from those currently offered in international affairs or public affairs, or may be interdisciplinary, developed in consultation with the advisor and focusing on a particular policy issue or area. Such a special field must be approved by the student's advisor and the dean.

SPECIAL PROGRAMS

Combined Master of Arts and Juris Doctor Degree Program

The School of Public and International Affairs cooperates with the National Law Center in offering a program leading to the combined degrees of Master of Arts and Juris Doctor. A student must be accepted for admission by both the School of Public and International Affairs and the National Law Center. Applications should be made separately, but at the same time. Both the School and the Center should be notified that the student is interested in the combined program. The student will be admitted to the School of Public and International Affairs for the academic year following the first year of study at the National Law Center, since the National Law Center stipulates that the first year of coursework for the Juris Doctor degree must be taken as a unit.

The Master of Arts degree program normally consists of the 30-semester-hour program which includes a thesis. The student selects a major offered by the School and fulfills all of the requirements for the Master of Arts degree as well as fulfilling the requirements for the Juris Doctor degree. Up to six semester hours of credit for coursework completed as part of the Juris Doctor curriculum and related to the student's degree program may be approved for transfer toward the Master of Arts degree. (Some of the course work required for the Master of Arts degree program may be applicable toward the Juris Doctor degree requirements.) Students will be registered in both the School of Public and International Affairs and the National Law Center and must maintain this concurrent registration until all degree requirements have been completed. All work for this combined degree program must be completed in five years, unless an extension of time is granted by the dean.

Institute for Sino-Soviet Studies

The Institute for Sino-Soviet Studies provides a program of specialized graduate study and research within the School of Public and International Affairs. Courses of the Institute are drawn from a variety of academic areas and thus provide an interdisciplinary approach to the study of the Soviet Union, Eastern Europe and East Asia, and of the Communist movement within and among the countries of these areas. Faculty members conduct seminars and reading courses in the disciplines of economics, geography, history, language and literature, law, political science and psychology. Research work is integrated with the teaching program.

Students who are preparing for the degree of Master of Arts in the fields of East Asian studies, international affairs, and Russian studies in the School of Public and International Affairs, or for the degree of Master of Arts in the fields of economics, history, or political science in the Graduate School of Arts and Sciences, with specialization in Sino-Soviet Studies, may take one-half of their coursework from the Institute's course offerings.

Students working toward the degree of Doctor of Philosophy in international relations with special emphasis on the Sino-Soviet area are expected to combine work in the Institute with work in the fields of economics,

history and political science. Doctoral candidates in the field of political science will take their Sino-Soviet work in the form of appropriate subfields of the major and minor fields. Doctoral candidates in the field of history are expected to take at least two of the four fields of the degree in the history of the countries of their specialization. All work leading to the degree of Doctor of Philosophy is under the general supervision of the Graduate School of Arts and Sciences and consultative committees designated by that School which direct the work of each graduate student upon admission to degree candidacy. A faculty member of the Institute will serve as advisor to the candidate. The candidate's committee will be formed from members of the selected disciplinary department. A candidate for such a degree should assume that the committee will require the substitution of a reading examination in Chinese or Russian for one of the two Western languages normally required for the degree.

A brochure describing in more detail the work of the Institute is available upon request.

War College Program

The School of Public and International Affairs offers an off-campus program at the National War College leading to the degree of Master of Science in International Affairs. Admission is limited to selected members of the faculty and student bodies of the War College.

The program of study is complementary to that portion of the War College's curriculum pertaining especially to international relations and foreign policy.

DIVISION OF UNIVERSITY STUDENTS

Dean J.G. Allee, Jr.
Assistant Dean B.K. Netland

DEAN'S COUNCIL*

J.G. Boswell, A.H. Desmond, H. Kenyon, R.W. Kenny

INTRODUCTION

The Division of University Students was established in 1930 to make the regular course offerings of the University more generally available to members of this metropolitan community and to others who are not at the time

* The Vice President for Academic Affairs, the Dean and the Assistant Dean of the Division are ex officio members of the Council.

candidates for degrees in this University. In this Division are registered students who wish to undertake university courses for credit or as auditors. University Students, often employed in government or industry, may be taking courses to increase their vocational fitness or to inform themselves on new developments in the arts and sciences. They may be taking courses as a matter of personal interest for cultural enrichment. Such students may be candidates for higher degrees in other institutions, sent here for special work as part of a graduate program. They may be undergraduates, matriculated in other colleges, taking summer sessions courses only or courses for transfer during the regular academic year with the approval of their own institution. They may be students from institutions outside the Washington metropolitan area enrolling in an appropriate "Washington Semester" program. To serve members of such groups and others not enrolled in degree-granting branches of the University is the function of the Division of University Students.

The privilege of attending George Washington University as a nondegree student is granted on the basis of maturity and proper preparation. Because no degree at George Washington University is involved, there can be no meaningful advisory system in the Division. However, students are invited to seek advice from academic departments. University students are urged to apply to the Office of Admissions for transfer to degree-granting branches whenever such action is appropriate.

All courses except those restricted to medical and law students and those limited to specific degree candidates are open to students in the Division of University Students. Students wishing to take Engineering and Applied Science courses should consult the *School of Engineering and Applied Science Bulletin*.

Registration in a given course may be denied students in this Division when space is needed for degree candidates. Students in this Division are not eligible to register for independent study or thesis or dissertation research.

An applicant who has been denied admission to any degree-granting branch of the University will not be considered for admission to the Division of University Students for the semester for which the applicant was denied, except upon written recommendation of the dean of the college or school that denied the applicant. However, an applicant who has been denied may be considered in subsequent semesters.

Nondegree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

An applicant who has been suspended from any educational institution for poor scholarship will not be considered for admission to the Division of University Students for one calendar year after the effective date of the suspension.

ENTRANCE REQUIREMENTS*

Good character and an academic background appropriate for the program of studies contemplated are required.

* For admission requirements for students from foreign institutions, see pages 25-27.

A person not working for a degree at this University will be considered for admission to the Division of University Students to take courses for which the applicant has adequate preparation, as determined by the departments concerned.

Although the deadline for applications for admission to the Division of University Students is the Friday before the first day of registration (see pages 5–7), applicants are urged to apply earlier because no special exceptions can be made to permit registration for credit after the last day for adding classes (see page 180) even though the requiring of credentials, records and test scores may delay the action on an application for admission. Insofar as time for full processing permits, applications submitted after the deadline may be considered. Subject to the permission of the department concerned, the deadlines for late registration, adding, dropping, and withdrawal do not apply to auditors.

Applicants who have graduated from high school within the previous two calendar years must pass designated aptitude tests or submit (1) a certificate of graduation from an accredited secondary school showing at least 15 units* including four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and two years of college preparatory mathematics; (2) the principal's statement that the student is prepared to undertake college work; and (3) scores on the College Entrance Examination Board's Scholastic Aptitude Test and English Composition Achievement Test. In addition to these records, applicants who have been subject to any form of academic or disciplinary action at any college or university during the previous calendar year must submit scholastic records from such college or university. Applicants for the Secondary School Honors Program and applicants who have not completed high school or the equivalent must submit scholastic records and may be required to take designated aptitude tests.

Scholastic records may be required of applicants who have attended any college or university within the previous calendar year, former students of this University who were on probation or suspended and who have since attended another college or university, and applicants who have ever been subject to academic or disciplinary action. When scholastic records are required, such students may be admitted for one semester or summer term only, under provisions stated by the Office of Admissions and pending receipt of academic records.

REGULATIONS

Regulations concerning admission, registration, fees and finances are stated on pages 20–33; other University regulations, on pages 44–53.

Prospective and registered students are urged to acquaint themselves with the regulations concerning attendance (see page 45) and withdrawal (see page 47).

The following specifically apply to all students in the Division of University Students:

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work

Last day to add a class for credit—end of first week of classes.

Last day to drop a class for credit or withdraw from the University—end of the ninth week of classes. (See Calendar for beginning date of classes, pages 5–7.)

Equivalent amounts of time apply to the summer sessions.

Academic Work Load

The normal academic work load is not more than 10 hours for a student employed more than 20 hours a week and not more than 18 hours for a full-time student. (Hours for courses graded *I*, "Incomplete," will be included in subsequent academic work load.) Exceptions to those limits must be approved by the dean.

Scholarship Requirements

A student who fails to maintain the scholarship requirements of this Division may be dismissed from the University.

Normally, any course may be repeated for credit. All grades received in the Division of University Students remain on the record, and scholarship requirements are based on the total record. A course taken for audit may not be repeated for credit (see page 48).

GRADES

Undergraduate—*A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal.

Graduate—For graduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal.

The credit/no credit option, which permits students to take courses in which they receive the grade of either "Credit" or "No Credit," is not available to students registered in the Division of University Students.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 46.

Removing an Incomplete—Although the grade of *I* may remain on the student's record indefinitely, the instructor should normally set a period (maximum of one year) within which the uncompleted work (usually the final examination or a required paper) must be made up. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere. An "Incomplete" cannot be made up after the lapse of one calendar year except by written permission of the Dean's Council. An "Incomplete" which is not removed within one calendar year remains as a grade of *I* on the student's record.

PROBATION AND SUSPENSION

A student not holding a previous degree is subject to the probation and suspension regulations of Columbian College of Arts and Sciences (see page 71).

A student holding a previous degree must maintain a cumulative quality-point index of 3.00 or the equivalent (a *B* average) in second-group or higher level courses and a cumulative index of 2.00 or the equivalent (a *C* average) in first-group courses. If the cumulative index in second-group or higher level courses falls below 3.00, the student will be placed on probation. If the cumulative index in second-group or higher level courses falls to 2.25 or below, the student will be suspended. The scholarship regulations for first-group coursework are the same as those of Columbian College of Arts and Sciences (see page 71).

A suspended student will not be permitted to register for any coursework, either for credit or for audit, in the Division during the period of suspension.

Changes in Program of Studies

Changes within the Division of University Students—A student may not change or drop courses (see "Withdrawal," page 47) or change status to that of auditor except with the approval of the dean.

Change from one section to another of the same course may be made with the approval of the dean and the department concerned.

Transfer within the University—Transfer to or from the Division of University Students may be made only with the approval of the deans concerned.

Application for transfer to degree candidacy will be considered only after the completion of at least one semester in the Division of University Students or upon request from the college or school to which the student is seeking admission.

The student wishing to transfer to degree candidacy must meet the conditions of the college or school to which the student is applying. It is the responsibility of the student to consult the relevant degree-granting college or school concerning all conditions to be met and the amount of work transferrable.

SECONDARY SCHOOL HONORS PROGRAM

The outstanding secondary school student in the Washington metropolitan area who wishes to enrich an academic background and participate in stimulating college work is encouraged to seek admission to George Washington University's Secondary School Honors Program. The Honors Student is enrolled in regular college courses of the student's own choosing appropriate to the student's level of study, background, and aptitude as determined through consultation with high school counselors and advisors at the University.

Credit earned in the Program is applicable toward a degree at George Washington University should the student later matriculate here. The transfer of credit elsewhere depends upon the policies of the individual schools to which the student might later apply.

Admission to the Honors Program is highly competitive. Normally, only 15 students a semester will be admitted to this Program, and each student will receive a scholarship totaling 50 per cent of tuition (excluding labora-

tory and University Center fees). Admission is for one semester only, but students doing well will be given preference for continuation and may be readmitted for a second semester. Criteria for admission are based on a transcript of the student's grades to date, available test scores, evidence of emotional and intellectual maturity, and the results of an interview with the director.

Application forms and further information may be obtained from B. K. Netland, Director of the Secondary School Honors Program, Division of University Students, George Washington University, Washington, D.C. 20052. No applications will be considered after the Friday before the final day of registration for the semester concerned. For application for the summer session see the *Summer Sessions Schedules*.

DIVISION OF EXPERIMENTAL PROGRAMS

Director R.S. French

The University is committed to the continuous development of new curricular options for its faculty and students. The Division of Experimental Programs has as its function the support of such curricular experimentation and development. This University-wide curricular development program has three objectives: (1) a more direct relationship between campus and off-campus resources and interests; (2) cooperation among the academic divisions of the University in the development and sponsorship of new courses and programs; and (3) experimentation with new ways of teaching and learning.

Under the auspices of the Division of Experimental Programs, students, faculty, and administrators throughout the University are involved in the planning, teaching and evaluating of experimental courses and programs. Many such curricular experiments are sponsored by other academic units of the University. There are presently two academic programs directly sponsored by the Division, the Program in Experimental Humanities and the Service-Learning Program.

The Program in Experimental Humanities offers courses which provide opportunities for students to combine sustained field study with classroom work. These courses are taught by interdisciplinary and interdivisional faculty teams.

The Service-Learning Program integrates supervised work-study with classroom seminars. Students in the Program are assigned to community groups, research organizations or governmental agencies. Assignments

are arranged by means of a formal agreement among the student, the Program and the off-campus agency.

The Division of Experimental Programs is charged with mobilizing academic resources throughout the University that can appropriately address needs in Washington communities, particularly the communities of poverty. Among the activities of the Division is a technical assistance program in the Congress Heights-Anacostia area, co-sponsored by the Anacostia Community Development Consortium. The Division, in conjunction with the Spanish Education Development Center, places bilingual students in the Spanish-speaking inner city. It also offers stipends to selected students for work in community agencies.

The Division of Experimental Programs is funded through a grant from the National Endowment for the Humanities, as well as from the general funds of the University.

ASSOCIATES

Marshall Davies, *Coordinator of Curriculum Research*
Roderick French, *Associate Director, Division of Experimental Programs*
Margot Kernan, *Coordinator, Film Studies Development*
Gregory Williams, *Assistant Director, Division of Experimental Programs*

STEERING COMMITTEE

Harold Frederick Bright, *Provost and Vice President for Academic Affairs, Chairman*
Marcella Brenner, *Professor of Education*
Ira Hubert Cisin, *Professor of Sociology*
Carl James Lange, *Associate Professor of Psychology; Assistant Vice President for Administration and Research*
Ralph Clarke Nash, *Professor of Law*
Thomas Eugene Piemme, *Professor of Medicine and Health Care Sciences*
Judith Ann Abrams Plotz, *Associate Professor of English*
Henry Solomon, *Professor of Economics; Dean of the Graduate School of Arts and Sciences*

THE SUMMER SESSIONS

Dean W.F.E. Long
Assistant Dean S.R. Paratore

During the summer of 1977, Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Government and Business Administration, the School of Public and International Affairs, the School of Engineering and Applied Science, the Division of University Students, and the School of Medicine and Health Sciences offer courses in one three-week session (May 16-June 9) and two five-week sessions (June 13-July 19 and July 20-August 24). The National Law Center offers courses in two six-week sessions and one 13-week session; the School of Education offers courses in six- and nine-week sessions and three three-week workshop sessions. The University also offers special programs during the summer which are not available during the regular academic year. Courses are offered during both day and evening hours.

Students who are enrolled at the University for the 1977 spring semester may register for the Summer Sessions without special application. All others must apply for admission or readmission. Those who do not wish to work toward a degree at the University may apply through the Division of University Students to take courses for which they are academically prepared (as determined by the departments concerned). Students who wish degree status may seek admission from the appropriate college or school within the University, and must meet the stated entrance requirements.

For a complete statement concerning summer term work, see the *Summer Sessions Schedule*.

OFFICE OF THE VICE PRESIDENT FOR POLICY STUDIES AND SPECIAL PROJECTS

Vice President L.H. Mayo

The Vice President for Policy Studies and Special Projects is responsible to the President of the University for developing an interdisciplinary capability for analyzing national policy issues. There is involvement with the Consortium universities, foundations, federal agencies, industry and

other organizations having interaction with the governmental process.

The office serves the University as the locus for discussion and as an advisory resource on interdepartmental and interdisciplinary research related to the analysis of public policies, and on curricula pertaining to broad social or environmental problems.

The University has made and sustained an institutional commitment, in terms of faculty recruitment and programmatic emphasis, to issue-oriented policy analysis as a major focus of its teaching and research activities. The result of over ten years development is a significant, institutional capability for comprehensive analysis of complex policy issues. Major programs oriented to public policy and governmental functions, which come within the ambit of this office, are described below.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

Director L.H. Mayo

The Program's primary objective is the continuing development of a University-wide policy research capability related to problems stemming from the impact of technological change on the processes, values, and institutions of society. The Program provides a neutral forum for consideration of these policy issues—whether in a retrospective, current, or prospective context—and provides an advisory and research resource for policy makers in the public and private sectors.

Primary components of the Program of Policy Studies in Science and Technology are:

1. *The Technology Assessment Group*—The Program has been intimately involved with the evolution of the concept of Technology Assessment (TA), now federally institutionalized in the Congressional Office of Technology Assessment. Much of the early work of the Program consists of theoretical, methodological, institutional, and historical studies. During the last six years the TA Group has carried out studies in a variety of subject areas including transportation, energy, community development, environmental noise, communication, and governmental structure and process, under contracts or grants from most of the major Federal agencies.

2. *The Graduate Program in Science, Technology, and Public Policy*—This Master's degree program is co-sponsored by the Program and the GW School of Public and International Affairs, so as to combine graduate training in science policy analysis (through SPIA) with major research undertakings (through the Program of Policy Studies). In six years, the program has become the largest degree-granting science policy program in the United States. Admissions information is contained in the SPIA section of this *Bulletin*.

3. *The Behavioral Studies Group*—This part of the Program focuses its studies on the social and behavioral factors associated with technological development. A multidisciplinary group, its capabilities and expertise include motivational and behavioral aspects of technology assessment in the areas of transportation, energy use, communication, energy conservation, new town program development, public health (family planning, community mental health), and education. Work includes applications of TA to program development and evaluation, as well as to dissemination

and utilization of strategies to improve the constructive uses of technologies in the above areas.

The Program of Policy Studies normally has between 15 and 20 professionals and many students working on several projects, most of which are problem-oriented and interdisciplinary in nature. Members of the faculty, graduate students, members of governmental agencies, and special consultants are regularly involved in our studies. To date the Program has performed over 75 policy studies and has published over 100 reports, monographs, books, and special papers which have been distributed to professionals and institutions throughout the world. Funding for the Program's activities has come from a variety of sources: the University; federal agencies, including DOT, EPA, ERDA, HEW, HUD, NASA, and NSF; and private foundations, including The Ford Foundation.

Professional Associates

Director Louis Mayo, *Vice President for Policy Studies and Special Projects; Professor of Law*

Associate Director Vary Coates, *Senior Staff Scientist and Director, Technology Assessment Group (Political Science)*

Mary Allen, *Research Assistant, Graduate Program in Science, Technology and Public Policy (Political Science)*

Betsy Amin-Arsala, *Consultant (Community Development)*

Robert Anthony, *Senior Staff Scientist (Physics, Systems Modeling)*

Yehuda Atai, *Consultant (Finance, Statistics and Information Systems)*

Guy Black, *Professor of Business Economics*

James Brown, *Senior Staff Scientist; Professor of Law*

Thomas Coyle, *Research Scientist*

Richard Ericson, *Senior Staff Scientist; Professor of Management*

Bernard Finn, *Consultant; Curator, Electricity, Smithsonian Institution*

Henry Hitchcock, *Research Associate (International Relations)*

David A. Kay, *Visiting Professor of International Affairs and Political Science, SPIA*

Ursula Kruse-Vaucienne, *Research Assistant and Director, U.S.-U.S.S.R. Science and Technology Exchange Project*

John Logsdon, *Research Scientist; Director, Graduate Program in Science, Technology and Public Policy; Associate Professor of Public Affairs and Political Science*

Joseph Margolin, *Senior Staff Scientist; Director, Behavioral Studies Group*

Milton Marney, *Consultant (Normative Systems Research)*

Jose M. Miccolis, *Manager, Brazil Science Policy Project*

Marion Misch, *Research Scientist; Deputy Director, Behavioral Studies Group*

Henry Nau, *Deputy Director, Graduate Program in Science, Technology and Public Policy; Assistant Professor of Political Science and International Affairs*

Michael Phillips, *Research Associate (Law)*

Herman Pollack, *Senior Staff Scientist (Political Science)*

Barbara F. Sachs, *Research Scientist and Manager, Noise Legal Survey*

Edward Studholme, *Manager, Airport Noise Reduction Policy and Planning Study*

Albert H. Teich, *Associate Professor of Public Affairs, SPIA*
Ernest Weiss, *Senior Staff Scientist (Transportation Programs Specialist)*
Frederick B. Wood, *Research Scientist (Management)*

HEALTH STAFF SEMINAR

Judith Miller, *Director*

The Health Staff Seminar is designed to assist professional staff members employed by the executive and legislative branches of the federal government in the health field to obtain a more realistic understanding of actual health practices and problems, and to improve communications between Washington-based professional staff members and experts in the field. Exposure to problems and issues facing the entire country is gained primarily through sequenced evening discussions or workshops and, where appropriate, site visits to various localities. Although attendance is primarily limited to Congressional aides and top-level health staff from the many government agencies involved in health, GWU students and faculty can be accommodated on a space-available basis.

CENTER FOR ADMINISTRATIVE JUSTICE

Director Milton Carrow, *Visiting Professor of Law*
Assistant Director (Education) Beve Sigal

The Center for Administrative Justice was established by the American Bar Association and became affiliated with George Washington University in September, 1973.

Its specific goals are as follows:

to provide educational and training opportunities in the law and related areas involved in the processes of administrative justice;
to engage in basic research in such areas and to undertake particular research projects for governmental and nongovernmental agencies;
to provide a resource for the initiation, exploration and development of new concepts, methods and mechanisms for the improvement of the processes of administrative justice;
to foster the development of ethical standards in the public interest among those engaged in the processes of administrative justice;
to establish and maintain a comprehensive library of materials pertaining to the law and law-related areas of administrative justice;
to publish and disseminate the Center's own and other basic and current materials in such areas;
to conduct conferences, seminars, workshops, colloquia, institutes, and other appropriate means for implementing all of the above goals.

Research programs deal with reform of administrative processes, with a present focus on mass administrative justice. Many of these programs relate to specific agencies or particular local problems and are undertaken at the invitation of responsible officials. Outside funding is sought for more comprehensive efforts, such as one presently underway to bring administrative law techniques to bear on relevant aspects of criminal justice. The Center is also engaged in a re-examination of adjudicative mechanisms of major government programs.

Funding for the Center's activities was initially provided by the American Bar Endowment. It now earns a substantial portion of its operational costs through its programs and projects, and the balance is supported by contributions from private foundations and corporations.

INSTITUTE FOR EDUCATIONAL LEADERSHIP

Director Samuel Halperin
Director, Education Policy Fellowship Program Paul Schindler
Director, Educational Staff Seminar Alice Kinkead
Coordinator, The Associates Program James Browne
Director, Postsecondary Education Convening Authority Kenneth C. Fischer
Project Coordinator Marilyn Kressel
Executive Producer, "Options in Education" John Merrow
Coordinator, Career Education Policy Project George Kaplan
Director, Family Impact Seminar A. Sidney Johnson III
Coordinator, Project on Compensatory Education Ray Peterson
Coordinator, Ford Fellows in Educational Journalism Diane Brundage
Chief Administrative Officer Dietra Rogers
Budget Officer June Frank

The Institute for Educational Leadership (IEL) seeks to strengthen present and potential leadership in American education at the policy levels of state and federal government. Established in 1971, IEL is a policy planning and coordinating agency for a number of related educational programs, including Education Policy Fellowship Program, Educational Staff Seminar, The Associates Program, Postsecondary Education Convening Authority and "Options in Education" over National Public Radio. IEL is supported by a major grant from The Ford Foundation and by various grants from foundations and federal agencies.

The objectives of the Institute are carried out under programs and activities of the following types:

1. *Education Policy Fellowship Program* (EPFP), formerly Washington Internships in Education, is a national program designed to help provide future leaders the skills in policymaking they must have to exert effective and enlightened leadership in American education. Funds for the program are provided by the Ford, Rockefeller, and Cleveland Foundations. Since 1965, the program has placed over 250 mid-career persons in one-year internships in public and private agencies involved in educational policy matters.

2. *Educational Staff Seminar* (ESS) is a professional development program designed for staff members employed by the executive and legislative branches of the federal government in the field of education. It is designed to expose these federal education policymakers to existing programs throughout the nation, as well as innovations, research and emerging ideas in the field.

3. *The Associates Program* (TAP) is an evolving IEL activity. Its emphasis up to now has been to provide seminars for legislators and other policymakers at state capitals. Begun in 1972 with three state educational seminars, TAP now sponsors 22 seminars, all directed by Associates who arrange five to 10 programs annually.

TAP maintains a network of state-level "generalists" (Associates) whose ties to IEL in the nation's capital provide rare linkages among federal and state education policy-setters. It also sponsors national and regional conferences dealing with state-level responsibilities in education.

4. *The Postsecondary Education Convening Authority* (PECA) was established, under a grant from the Department of Health, Education, and Welfare's fund for the improvement of postsecondary education, as an issue development service for consideration and transmission of key policy issues in postsecondary education. The PECA sponsors conferences, research efforts, task force groups and publications focusing on such issues as institutional licensing, consumer protection, state financing, and adult learning.

5. "*Options in Education*", co-produced by IEL and National Public Radio, is a weekly series heard over most of NPR's 190 member stations from coast to coast. Voice of America rebroadcasts the one-hour programs, and IEL makes cassettes and transcripts available at minimum cost. "Options" has received awards from the Education Writers Association (1974 and 1975) and from the Council for Advancement and Support of Education (1974). A list of NPR member stations and a catalog of available cassettes and transcripts are available from IEL.

6. *The Career Education Policy Project* (CEPP) airs the issues of education, work, and society for educational decision-makers. Funded by the U.S. Office of Education, CEPP uses the resources of other IEL programs—ESS and TAP—to inform both policymakers and the public of the issues and the potential of the career education movement. It also sponsors Washington Policy Seminars for policy-level career educators.

7. *The Project on Compensatory Education* (PCE), responding to continuing state and federal emphasis on equal educational opportunity and the right of each child to an adequate education, is sponsored by the U.S. Office of Education. It seeks to identify the major public policy issues in the governance of compensatory education at the federal, state and local levels.

8. *Family Impact Seminar* (FIS) seeks to identify and assess the effect on families and children of a variety of public policies. The Seminar and its several task forces are composed of scholars and policymakers. Together, they examine and test the feasibility of developing "family impact statements" on selected government policies and programs. The specific issues to be examined are selected from a broad range of existing or proposed public policies.

9. *Ford Fellows in Educational Journalism* is an intensive, short-term professional development program for educational reporters and journalists. This pioneering effort offers nine Fellows a "sabbatical" from the fast-paced immediacy of daily educational reporting and allows them to pursue a full-time, four-month course of independent study in their designated educational interest areas. The program reflects the conviction that better informed media will be a direct and positive influence for better education.

For further information on any of the above programs, please contact the Institute for Educational Leadership, 1001 Connecticut Ave., N.W.

SPONSORED RESEARCH

Vice President for Administration and Research C.J. Lange

These special programs were established for the specific purpose of considering, in an academic atmosphere, problems proposed by the individual projects or submitted by the sponsoring agency. Cooperation between these programs and the various departments of instruction is as close as the nature and needs of the programs and departments will permit.

BIOMETRIC LABORATORY

Director Richard Bonato

The Biometric Laboratory, established in the fall of 1960 and currently supported by the National Institute of Mental Health grant program, is engaged in a broad spectrum of psychotropic drug assessment. The laboratory assists investigators throughout the United States in planning research and in analyzing data. The majority of these research projects concern the effects of drugs on behavior.

CENTER FOR SOCIAL POLICY STUDIES

Director Sar Levitan

The Center for Social Policy Studies is devoted to the evaluation of federally-supported manpower, antipoverty and related programs. The Center is financed by a grant from the Ford Foundation and offers, in conjunction with the Department of Economics, graduate courses in labor economics and social policy.

EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) CLEARINGHOUSE ON HIGHER EDUCATION

Director Peter Muirhead
Associate Director Jonathan Fife

The Educational Resources Information Center (ERIC) Clearinghouse on Higher Education, established in the fall of 1968, is supported by the National Institute of Education. The Clearinghouse is responsible for the acquisition, evaluation, abstracting, indexing and dissemination of research reports and other documents dealing with problems and issues in higher education, prepares state-of-the-art and review papers related to higher education and responds to individual inquires concerned with higher education.

HEALTH STAFF SEMINAR

See the Office of the Vice President for Policy Studies and Special Projects, page 187.

INSTITUTE FOR EDUCATIONAL LEADERSHIP

Education Policy Fellowship Program
Educational Staff Seminar
The Associates Program
Postsecondary Education Convening Authority
Career Education Policy Project
"Options in Education" over National Public Radio
The Project on Compensatory Education
Family Impact Seminar
Ford Fellows in Educational Journalism

See the Office of the Vice President for Policy Studies and Special Projects, pages 188–89).

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

Director W.H. Marlow

The Institute for Management Science and Engineering provides a multi-disciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. Through its Program in Logistics, the Institute performs research leading to the development of a science in logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts.

MID-EAST REGIONAL RESOURCE CENTER

Director Raymond Cottrell

The Mid-east Regional Resource Center is one of 13 similar centers serving the country under contract to the Bureau of Education for the Handicapped, U. S. Office of Education. The region or area served includes Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina and the District of Columbia. The George Washington University has entered into an informal partnership with the University of Kentucky and the University of North Carolina to establish a coordinated Learning Resource System for handicapped children.

NATURAL RESOURCES POLICY CENTER

Director Mary Holman

The Natural Resources Policy Center was established in September, 1965 to sponsor faculty and student research in the area of natural resources and environmental quality; to develop and undertake activities that promote undergraduate and graduate education; and to train employees of public resource agencies. The program of the Center focuses particularly on increasing the contribution of the social sciences to the solution of contemporary problems relating to the management and development of natural resources. The Natural Resources Policy Center, which provides a focus on natural resource and environmental quality problems and issues, is an integral part of the Department of Economics in both the design of its research program and its courses.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

See the Office of the Vice President for Policy Studies and Special Projects pages 185–87.

SOCIAL RESEARCH GROUP

Director Ira Cisin
Associate Director H.J. Parry

The Social Research Group conducts surveys and experiments with concentration on basic research underlying an approach to the solution of social problems.

COLLEGES AND SCHOOLS—DEGREE PROGRAMS

Columbian College of Arts and Sciences: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart.Sc.), Bachelor of Science in Geodesy (B.S. in Geod.), and Bachelor of Science in Oceanography (B.S. in Ocea.)

Graduate School of Arts and Sciences: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.), and Doctor of Philosophy (Ph.D.)

School of Medicine and Health Sciences: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

National Law Center: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

School of Engineering and Applied Science: Bachelor of Science (Civil Engineering) B.S.[C.E.]), Bachelor of Science (Electrical Engineering) (B.S. [E.E.]), Bachelor of Science (Mechanical Engineering) (B.S. [M.E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

School of Education: Bachelor of Arts in Education (B.A. in Ed.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education (M.A. in Ed.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

School of Government and Business Administration: Bachelor of Business Administration (B.B.A.), Bachelor of Science in Administration (B.S. in Adm.), Bachelor of Science in Health Care Administration (B.S. in H.C.A.), Master of Arts in Health Care Administration (M.A. in H.C.A.), Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.), Master of Science in Administration (M.S. in Adm.), Master of Urban and Regional Planning (M.of Urb. and Reg.Plan.), Post-Master's Graduate Certificate in Health Care Administration (Grad.Cert. in H.C.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

School of Public and International Affairs: Bachelor of Arts (B.A.), Master of Arts (M.A.), and Master of Science in International Affairs (M.S.I.A.)

COURSES OF INSTRUCTION

The following pages contain listings and descriptions of courses offered by the departments of instruction and special interdepartmental programs. The courses as here listed are subject to change. The University reserves the right to withdraw any course announced.

HOURS OF INSTRUCTION

Classes are scheduled in the morning, afternoon, and evening. Evening and daytime sections of the same course are identical, are taught by the same staff of instructors and carry the same amount of credit.

EXPLANATION OF COURSE NUMBERS

First-group courses—Courses numbered from 1 to 100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

Second-group courses—Courses numbered from 101 to 200 are planned for students in the junior and senior years. Except for accounting courses, they may be taken for graduate credit only upon the approval of the Dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work to receive graduate credit. Accounting courses numbered 101-200 may not be taken for graduate credit.

Third-group courses—Courses numbered from 201 to 300 in the Graduate School of Arts and Sciences and the School of Government and Business Administration, and courses numbered 201 to 400 in the School of Education, are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors in the School of Government and Business Administration registering for these courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course and the prior approval of the dean. Non-degree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

Fourth-group courses—Courses numbered 301 to 400 in the Graduate School of Arts and Sciences are limited to graduate students, but they are primarily for doctoral candidates. Courses numbered 301 to 400 in the School of Government and Business Administration are limited to doctoral students. In the School of Education fourth-group courses, numbered 40

to 500, are limited to graduate students with master's degrees from accredited institutions.

Fifth-group courses—Courses numbered 701 and 721 explore topics not normally included in departmental offerings and utilize insights and methods from disciplines in addition to those usually identified with the sponsoring department. The 701 number is used to designate courses taught by an individual faculty member; the 721 number is used to designate upper-level courses in which faculty from two or more departments investigate a topic of mutual academic interest.

KEY TO ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
HCA	Health Care Administration
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
IAf	International Affairs
Idis	Interdisciplinary Courses
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
LEnf	Law Enforcement
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opth	Ophthalmology
Oral	Oral Biology
Orth	Orthopaedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
Rad	Radiology

Rel	Religion	**SpDr**	Speech and Drama
SLP	Service Learning Program	**Stat**	Statistics
SPSc	Service-Learning Political Science	**Surg**	Surgery
Slav	Slavic Languages and Literatures	**TCom**	Telecommunication Operations
Soc	Sociology	**U&RP**	Urban and Regional Planning
Span	Spanish	**Urol**	Urology
SpEd	Special Education	**WStu**	Women's Studies

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving three semester hours of credit each semester is marked (3–3), and a semester course giving three semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following most course descriptions is a parenthetical statement listing the semester (fall or spring) for which the course is scheduled. The term "academic year" is used only with two-semester courses, and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. If no parenthetical statement appears, the course is not scheduled to be offered during the fall or spring semesters of the current academic year. Not all offerings for the summer sessions are listed in this *Bulletin*. Students should consult the *Summer Sessions Schedule of Classes* for additional summer offering. A *Schedule of Classes* is published each fall and spring semester to provide information concerning the time of coure offerings.

ACCOUNTING

Professors **E.J.B. Lewis, A.J. Mastro *(Chairman)***
Professorial Lecturer **J. Hilmy**
Associate Professors F.C. Kurtz, C. Paik, M.G. Gallagher
Associate Professorial Lecturer **F.W. Segel**
Assistant Professors **G. Bodnar, P. Welling**
Assistant Professorial Lecturer **E.J. Shuchart**
Adjunct Intructors **R.S. Capps, A. Hammad**

Bachelor of Business Administration in the field of Accounting—See pages 131–38.

Master of Business Administration with a field of concentration in Accounting—Prerequisite: a bachelor's degree, see pages 142–43.

Required: the general requirements, pages 143–46. The recognized Common Body of Knowledge in business administration is required of all candidates.

his knowledge may be obtained as part of an undergraduate degree in business as part of the total M.B.A. degree program at this University. The Common ody of Knowledge may be satisfied by the following courses at this University, the equivalent: Acct 115; BAd 131, 141, 161, 198; Econ 1; Mgt 118; and Stat . In addition to this requirement the student's program of study will con- of (1) the required courses in administration (Mgt 201, 204, 207; Acct 276); the accounting concentration (Acct 215, 262, 275,* 282,* 296; BAd 231); and a research course (Acct 295 for students not electing a thesis and Acct 300 r students electing a thesis); and (4) six semester hours of electives, selected h the approval of the advisor, from two SGBA fields other than accounting. Programs of study in Accounting leading to degrees of *Doctor of Business dministration and Doctor of Public Administration*—See pages 156–58.

Accounting courses numbered below the 200 level may not be taken for raduate credit. Accounting courses numbered 201 and above may not be taken r undergraduate credit.

irst Group

1–2 Introductory Accounting (3–3) Gallagher, Kurtz

Basic understanding of accounting concepts, procedures, analyses and reports; the accounting measurement and communications of significant economic and financial data. There is a $25 laboratory fee for Acct 1. Prerequisite to Acct 2: Acct 1. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 1. (Acct 1 and 2—fall and spring)

econd Group

101 Cost and Budgetary Control (3) Bodnar

Cost behavior and volume-profit relationships, responsibility accounting, standard costs, flexible budgets, cost structures for control and motivation, relevant costs, cost concepts. Prerequisite: Acct 1–2. Students who have received credit for Acct 193 or 215 cannot receive credit for Acct 101. (Fall and spring)

111 Financial Statement Analysis (3) Hilmy

Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Acct 1–2. (Spring)

115 Financial Accounting (3) Gallagher, Segel

Role of accounting in decision-making of external parties; understanding, interpretation and implementation of financial accounting. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 115. (Fall and spring)

121 Intermediate Accounting (3) Mastro

In-depth study of accounting functions and basic theory; acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Acct 1–2. (Fall)

132 Accounting Theory (3) Mastro

Current thought as reflected in the pronouncements of leading pro-

* Acct 215 must be taken in place of Acct 275 or 282 if a course in cost and budgetary accounting was not taken prior to entering the M.B.A. program.

fessional and accounting research associations, major contributions to accounting literature. Prerequisite: Acct 121. (Spring)

141 **Governmental Accounting** (3) Lewis

Appropriation, encumbrance, and fund accounting for governmental and institutional entities. Prerequisite: Acct 1–2. (Fall)

161 **Federal Income Taxation** (3) Gallagher

Federal income tax concepts applicable to individuals and corporations, differences between tax accounting and financial accounting. (Fall and spring)

171 **Auditing** (3) Kurtz

Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, form-preparation-use of audit work papers, audit evidence. Prerequisite: Acct 121. (Fall)

181 **Accounting Systems** (3) Bodnar

Organization and use of accounting information: origination, classification, control, and reporting; development, design, and installation of accounting systems; accounting communication patterns. Prerequisite: Acct 101, 171. (Spring)

191 **Advanced Accounting** (3) Gallagher

Application of accounting theory to special areas: consolidated statements, business combinations, earnings per share, foreign exchange, price-level adjusted statements, source and application of funds. Prerequisite: Acct 121. (Spring)

193 **Business Budgeting** (3) Lewis, Paik

Principles and procedures in the development, installation, and operation of a system of budgetary control to aid management. Prerequisite: Acct 1–2. Students who have received credit for Acct 101 cannot receive credit for Acct 193. (Fall and spring)

199 **Accounting Practice Internship** (3) Mastro

Concepts, procedures and standards of auditing practice obtained as an intern with a firm or agency. Prerequisite: 15 semester hours of accounting courses (including a course in auditing), senior status and approval of the chairman of the department.

Third Group

215 **Management Accounting** (3) Welling

Role of accounting in management decision-making processes; understanding of accounting influences on resource allocation decisions in organizations. Prerequisite: Acct 115 or a similar financial accounting course. Students who have received credit for a similar managerial accounting course cannot receive credit for Acct 215. (Fall and spring)

262 **Business Income Taxation** (3) Gallagher

Federal income tax concepts applicable to corporations, partnerships, and their owners; emphasis on tax planning factors in business decisions and tax research. (Fall)

275 **Contemporary Auditing Theory and Procedures** (3) Kurtz
Study of auditing concepts: generally accepted auditing standards, application of statistical sampling to auditing, audit of electronic data processing systems. Prerequisite: Acct 115 and 215, or equivalent. (Spring)

276 **Management Planning and Control** (3) Paik
Integrative case study approach to management systems for planning, control, and decisions: value indices for organizational subunits, transfer pricing, contemporary control systems, accounting framework and cycle. Prerequisite: Acct 115 and 215, or equivalent. (Spring)

282 **Accounting Information Systems** (3) Bodnar
Development and application of accounting system theory, including analysis, design, and implementation. Integration of automatic data processing, accounting systems, and management information systems. Prerequisite: Acct 115 and 215, or equivalent. (Fall)

290 **Special Topics in Accounting** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Research Methods** (3) Paik
(Fall and spring)

296 **Seminar in Accounting** (3) Mastro
Selected accounting studies; critical analysis and evaluation developed in seminar discussions and papers. Prerequisite: Acct 115 and 215, or equivalent. (Spring)

298 **Directed Readings and Research in Accounting** (3) Mastro and Staff

299 **Thesis Seminar** (3) Mastro and Staff
(Fall and spring)

300 **Thesis Research** (3) Mastro and Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Mastro and Staff
Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Mastro and Staff
Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

See English.

AMERICAN STUDIES PROGRAM

Professors R.H. Walker, Jr., C.C. Mondale
Adjunct Professor F. Gutheim
Associate Professor B.M. Mergen *(Director)*
Associate Professorial Lecturer J. Mahoney, Jr.
Assistant Professors H.F. Gillette, Jr., H.S. Diner *(Visiting)*
Special Lecturer L. Miller

Faculty Advisory Committee

B.M. Mergen *(Chairman)*, R.N. Ganz, F.S. Grubar, R.L. Humphrey, H.L. LeBlanc, C.H. Pfuntner, R.P. Sharkey, R.W. Stephens, A.M. Yezer, D. Wallace, Jr.

American Studies Council

The Council serves the American Studies Program in an advisory capacity. It includes representatives from the student body, the Washington community, the faculty, alumni, and affiliated programs.

Bachelor of Arts with a major in American Civilization (Field-of-Study)—The following requirements must be fulfilled.

1. The general requirements stated on pages 73–74, 80–86.

2. Prerequisite course—AmCv 71 72. (In preparation for the major field it is recommended that students take the introductory American history course and elect introductory courses in anthropology, art, economics, English, geography and regional science, philosophy, political science, religion, and sociology.)

3. Required courses in the major—(a) 15 semester hours of approved second-group courses in the humanities (history may be elected for [a] or [b], but not for both); (b) 15 semester hours of approved second-group courses in social studies; (c) AmCv 179 80, which must be taken in the senior year.

4. In addition to the meaningful initiation requirement (see pages 73–74) students must elect three or four additional semester hours in the natural and mathematical sciences or in geography and regional science.

The major examination required of all seniors must be satisfactorily completed in the final year.

Special Honors will be awarded to students who fulfill the general requirements (see pages 50–51) and in addition (1) receive grades of *A* in at least half of their courses in the two areas of concentration and (2) receive honors in the major examination.

Two years of a foreign language or adequate preparation in statistics, logic, or linguistics is strongly recommended. Students should consult frequently with an American Civilization adviser.

Master of Arts in the field of American Civilization—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in American Civilization or in the subject in which concentration is contemplated.

Required: the general requirements, pages 89–97, including (1) AmCv 271 [illegible] (six semester hours), a seminar in the methods and materials for teaching and research in American Civilization; (2) 18 additional semester hours in a carefully related pattern, focusing in a concentrated approach to the study of American Civilization; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the main emphasis falls; (4) a Master's Comprehensive Examination reflecting the candi-

dent's area of concentration. Special options in the degree program include the following:

1. *A concentration in Museum Training*—Course emphasis on substantive research in material culture under direction of staff at the Smithsonian Institution. Required: in addition to the general requirements outlined above, AmCv 351. Recommended, but not required: AmCv 252, 351 or 352 (advanced research), AmCv 251 (internship) and other related courses offered by the departments of anthropology, art, or education.

2. *A concentration in Historic Preservation*—Course emphasis on interpreting issues in historic preservation through a humanistic framework. Prerequisite: background in urban history. Required: in addition to the general requirements outlined above, AmCv 277 78. Recommended, but not required: additional courses in architectural history, urban and regional planning, and local history.

Master of Arts in Museum Studies (offered in cooperation with the Anthropology and Art Departments), see pages 384–86.

Doctor of Philosophy in the field of American Civilization. This program combines work in the humanities and/or social sciences as preparation for research and teaching, with the option of stressing preparation for museum and library careers. Applicants are required to have an adequate background in the humanities and or social sciences as they apply to the understanding of American civilization.

Required: the general requirements, pages 89 91, 97 99. Candidates must pass a General Examination in four areas. An area in American cultural history and an area in the culture of some area outside the United States (i.e., English literature, European history) are required. The other two areas may be chosen from the following groups: (1) American diplomatic, economic, political, social, or urban history; American literature, art, philosophy or religion; Afro-American history; historic preservation; or some areas of the social and behavioral sciences; (2) in affiliation with the Library of Congress—supervised historical study in bibliographic resources including American history and politics, cartography, cross-cultural studies, government documents, graphic arts and music, motion pictures and recorded sound, printing and bookmaking; (3) in affiliation with the Smithsonian Institution (Museum of History and Technology, National Portrait Gallery and National Collection of Fine Arts)—supervised studies including architectural history, decorative arts, ethno-history, historical archaeology, history of science, history of technology, industrial archeology, material aspects of American civilization, and various fields in the history of art. Additional areas of study may be arranged within the University and in both the Library of Congress and Smithsonian cooperative programs. Special announcements concerning these programs are issued periodically and are available in the Office of the Director of the American Studies Program.

Research fields for the dissertation may be chosen from any of the above except those dealing with the culture of an area outside the United States.

First Group

71–72 **Introduction to American Civilization** (3–3) Mergen, Gillette

Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance. (Academic year)

Second Group

161–62 **Studies in American Literature** (3–3) Sten

Same as Engl 161 62. Major factors in the national cultural tradition as shown by outstanding writers. (Academic year)

177 **Introduction to Historic Preservation** (3) Staff

Washington, D.C. will be the primary exhibit for the study of histor... preservation as it has developed over the past century. Experien... with preservation issues as shown by examples in other localities will also be discussed. Lectures, class discussions of the readings and field trips to neighborhoods and sites subjected to preservation efforts. (Summer)

179–80 **Proseminar in American Civilization** (3–3) Walker

Coordinating course for seniors majoring in American Civilization. (Academic year)

186 **U.S. Urban History**

Same as Hist 186. Development and characteristics of American cities. (Fall)

190 **Afro-American History and Literature** (3) Staff

Main themes of black history and literature from the 17th through the 20th centuries. Literary works treated in their historical context, emphasizing their usefulness as commentaries on the black experience. (Summer)

*192 **The American Cinema** (3) Mergen

History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. (Spring)

195 **Independent Study** (3) Staff

Open to a limited number of American Civilization majors as directed research or as an internship with a Washington museum or historical society. Prerequisite: approval of the instructor. (Fall and Spring)

†197 **Oral History and Interview Techniques** (4) Staff

Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area. (Spring)

Third Group

215 **The Military in American Civilization** (3) Staff

Multidisciplinary approach to understanding the roles and symbols of the armed services in American history. Lecture, discussion. Open to juniors, seniors, and graduate students. (Summer)

225 **History of Washington, D.C.** (3) Gutheim

Joint offering of the American Studies Program and the department of history.

‡254 **Seminar: Folklore in America** (3) Golla

Various aspects of American traditional culture, including the theory and methodology of folklore research. Primary emphasis on Afro-

* Joint offering of the American Studies Program and the Speech and Drama Department.
† Joint offering of the American Studies Program and the History Department
‡ Joint offering of the American Studies Program and the Anthropology Department

and Afro-American traditional cultures, with some consideration of other ethnic groups. (Summer)

271–72 **Seminar: Scope and Methods in American Studies** (3–3) Mondale
Consideration of American studies as an area for research and teaching; introduction to bibliography. Required of candidates for the degree of Master of Arts in the field of American Civilization. (Academic year)

*273–74 **Research Seminar: Materials in Afro-American Culture** (3–3)
Prerequisite: Hist 173–74 or equivalent.

†277–78 **Historic Preservation** (3–3) Gutheim
The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. (Academic year)

280 **Seminar: Urban History** (3)
(Spring)

289–90 **Seminar: Topics in American Civilization** (3–3) Staff
Research problems selected by the instructor. Preparation in American cultural history or other area appropriate to the topic of the seminar. (Academic year)

295 **Independent Study** (arr.) Staff
Limited to master's candidates. Permission of instructor, in writing, required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

*373–74 **Readings on the Negro in American Culture** (3–3)
For students preparing for the Doctor of Philosophy general examination in the field of the Negro in American culture.

379–80 **Readings in American Cultural History** (3–3) Walker
For students preparing for the Doctor of Philosophy general examination in the field of American Civilization. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

* Joint offering of the American Studies Program and the History Department.
† Joint offering of the American Studies Program and the History and Urban and Regional Planning Departments.

COURSES OFFERED IN AFFILIATION WITH THE LIBRARY OF CONGRESS

The Graduate School of Arts and Sciences is affiliated with the Library of Congress in a program leading to the degree of Doctor of Philosophy. The following courses are offered at the Library of Congress by members of its staff

Third Group

255–56 **Research Orientation Seminar: Americana in the Library of Congress** (3–3) Cole, Walker

Examination of the collections of the Library of Congress with the aim of increasing understanding of American culture and awareness of library-oriented research problems and possibilities. For students in the affiliated doctoral program, this course may lead directly to a field in "Research Materials for the Study of American Life: Their Content, Collection, Arrangement, and Use." (Academic year 1977–78 and alternate years)

Fourth Group

355–56 **Practicum: Advanced Library Research** (3–3)

Practical problems in control of library materials with emphasis on collections in the Library of Congress. A reading field in the affiliated program. Prerequisite: AmCv 255–56. (Academic year)

389 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Library of Congress. May be repeated for credit. (Fall and spring)

390 **Dissertation Research** (arr.)

For Doctor of Philosophy candidates preparing dissertations based upon or significantly related to collections of the Library of Congress. Supervised by specialists at the Library. Prerequisite: AmCv 355–56. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE SMITHSONIAN INSTITUTION

The Graduate School of Arts and Sciences is affiliated with the Smithsonian Institution's Program for Graduate Students in the History of American Civilization. The following courses are offered at the Museum of History and Technology and at the National Portrait Gallery, by members of their staffs:

Third Group

250 **Orientation Course: Material Aspects of American Civilization** (3) Washburn, Mergen

Familiarization with the historical collections of the Smithsonian Institution and introduction to opportunities for research and publication based on historical objects. Required of all students in the master's and doctoral programs affiliated with the Smithsonian Institution. (Fall)

251–52 **Museum Research and Education** (3–3) Washburn and Staff
Supervised work and or study under the direction of Smithsonian staff members and research associates—museum visitor behavior, costumes and furnishings, decorative arts, and photography as historical documentation. (Fall and spring)

*270 **Seminar: Museum Exhibiting** (3) Mahoney
Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition, problems of museum communication and education. (Fall)

†284 **Seminar: Studies in American Art and History** (3) Miller
Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. May be repeated for credit. (Fall and spring)

‡294 **Field Research in Historical Archeology** (3)
Field techniques, including excavation, recording, photography, preservation, laboratory analysis and interpretation, supplemented by seminars on the history, ethnography, and ethnohistory of 17th century St. Mary's City, Md. (Summer)

Fourth Group

351–52 **Research in Selected Aspects of American Civilization** (3–3)
Supervised study and/or field work in selected subject areas related to the activities of the Smithsonian Institution. (Fall or spring)

394 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Smithsonian Institution. May be repeated for credit. (Fall and spring)

395 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations significantly related to the material aspects of American civilization. Students work under curatorial supervision at the Smithsonian Institution. Prerequisite: AmCv 351–52. May be repeated for credit. (Fall and spring)

ANATOMY

Professors F.D. Allan, T.N. Johnson, R.S. Snell *(Chairman)*, E.N. Albert
Associate Professor M.J. Koering
Assistant Professor J. Kerns

Doctor of Philosophy in the field of Anatomy—Required: the general requirements, pages 89–91, 97–99. Candidates must fulfill the tool requirement by demonstrating high proficiency in German, French, or Russian or by demon-

* Joint offering of the American Studies Program and the Anthropology Department.
† Joint offering of the American Studies Program and the Art Department.
‡ Joint offering of the American Studies Program and the Anthropology Department in cooperation with St. Mary's College, the Smithsonian Institution, and the St. Mary's (Md.) City Commission.

strating a reading knowledge of any two of the above languages. At the discretion of the department, one of the above languages may be replaced by passing an approved course in biostatistics or computer programming with a grade of B or better. The General Examination must cover at least three fields.

Research fields: cell ultrastructure, embryology, gross anatomy, histology, human genetics, neuroanatomy, and physical anthropology.

Third Group

202 Gross Anatomy (6) — Snell and Staff

Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 Human Embryology (1) — Allan

Origin and development of human body: emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 Neuroanatomy (2) — Johnson

Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, $13. (Fall)

205 Human Microscopic Anatomy (3) — Albert and Staff

Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 Scanning Electron Microscopy (3) — Albert, Morse, Olson

Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. (Spring)

208 Comparative Vertebrate Neurology (1) — Johnson

Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 The Use of Audiovisual Techniques in Anatomy (2) — Allan

Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, $20. (Spring)

210 The Use of Computers in Anatomy (2) — Snell

Applying computer techniques to the problems of learning anatomy. Limited enrollment. Laboratory fee, $20. (Spring)

212 Neurobiology (3) (Same as Phyl 212) — Staff

An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221–22 Seminar (1–1) — Olson

Research reports and discussions of special topics by guest lecturers, staff, and students. (Academic year)

249 Introduction to Anatomical Research (1) — Staff

Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 Physical Anthropology (1) — Angel

Variations in humans and factors affecting them: human evolution

and racial differences: anatomy and culture of ancient humans. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of midgestational fetus. Comparison of fetal and adult structures. 20 students. Laboratory fee, $10. (Spring)

256 **Human Genetics** (1) C. B. Jacobson*
General principles of genetics, new cytogenetic techniques, aneuploidy in humans and its significance, biochemical aspects of heredity, genetic counseling. (Spring)

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Electron Microscopy in Cellular Biology—Laboratory** (2) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $15. (Fall and spring)

262 **Gross Anatomy of Upper and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10 (Spring)

270 **Dissection of the Human Brain** (1) Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system, conferences and assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

272 **Autonomic Nervous System** (1) Allan
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff
Lectures and conferences on selected anatomical subspecialties – endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)

* Dr. Jacobson is Associate Clinical Professor of Obstetrics and Gynecology in the University's School of Medicine and Health Sciences

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance. (Spring)

295 **Research** (arr.) Staff
Content differs each time course is offered: may be repeated once for credit. Fee to be arranged. (Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANTHROPOLOGY

Professors R.K. Lewis, R.B. McKay *(Research)*, R.M. Krulfeld
Professorial Lecturer J.L. Angel
Associate Professors R.L. Humphrey, Jr. *(Chairman)*, V.K. Golla, S.L. Simons
Associate Professorial Lecturers A.G. Wright, J. Mahoney, Jr., G. Stuart
Assistant Professors A.S. Brooks, J.E. Yellen *(Research)*
Assistant Professorial Lecturers S. Hertz, C.R. Rose
Lecturer J. Lanouette

Bachelor of Arts with a major in anthropology (departmental)—The following **requirements must be fulfilled:**

1. **The general requirements as stated on pages 73–74, 80–86.**
2. **Prerequisite course—Anth 1–2.**
3. Required courses in other areas—(a) 12 semester hours, or equivalent, of introductory French, German, Russian, or Spanish (or another major language approved by the Anthropology Department); (b) six to twelve semester hours of course work in related departments. Recommended for ethnological emphasis are courses in economics, political science, psychology, and sociology; for archeological emphasis, courses in American civilization, art history, geography and regional science, geology; and history; for emphasis in physical anthropology, courses in anatomy and biological sciences. Statistics is strongly **recommended for all anthropology majors.**
4. Requirements for the major—24 to 36 semester hours in second-group anthropology courses, including Anth 192 and courses in each of the following categories: aspects of culture (courses numbered in the 150s), linguistics (courses numbered in the 160s), ethnology (courses numbered in the 170s), and physical anthropology or archeology (courses numbered in the 180s). Qualified seniors may enroll in 200-level courses with permission of the instructor. Up to six semester hours of ethnographic or archeological field school credit may be accepted and applied toward the major with the approval of the department, and majors are encouraged to participate in such summer programs offered here or elsewhere. Opportunities for field and laboratory research are also periodically available to exceptionally able students both with staff members

conducting research and at one of the several excellent anthropological museum facilities in the area. Credit for such work may be granted through registration for Anth 195.

Bachelor of Arts with a major in classical archeology and anthropology (departmental)—An interdepartmental major offered by the Anthropology and Art Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult a departmental adviser regarding courses to be taken in satisfying the requirement for meaningful initiation into the Natural and Mathematical Sciences.)
2. Prerequisite course—Anth 1–2.
3. Required courses in the major—Anth 152, 158, 177, 183; Art 101, 102, 103, 111; Hist 109, 110. (A reading knowledge of French and German is recommended.)

Master of Arts in the field of anthropology—Prerequisite: a Bachelor of Arts degree with a major in anthropology from this University, or an equivalent degree.

Required: the general requirements, pages 89–97. The minimum requirement consists of 24 semester hours of anthropology courses plus a thesis (equivalent to six semester hours). A thesis is preferred; however, under certain circumstances, with the approval of the department, students may elect a program of study consisting of 36 semester hours of anthropology courses without a thesis. There are no specific required courses; however, the student's program must cover the major areas of anthropological interest which have been approved in advance by the department's graduate adviser. A reading knowledge examination in one foreign language must be passed before beginning the third semester of graduate work. (A tool requirement in statistics may be substituted for the foreign language reading examination with the approval of the department.) Students who are writing a thesis must take the Master's Comprehensive Examination before registration for the second half of thesis work.

Master of Arts in anthropology with a concentration in museum training—The program is designed to provide an overall knowledge of the theoretical and practical aspects of museum operations along with a background in the various subdisciplines of anthropology. Prerequisite: a Bachelor of Arts degree with a major in anthropology from this University or an equivalent degree.

Required: the general requirements, pages 89–97. The program of study consists of 36 to 42 hours of course work which should include 12 to 15 hours of museum-related courses or internships (Anth 290 or 295). A limited number of internships are available at the Smithsonian Institution and other area museums. A reading knowledge examination in a major foreign language must be passed before the beginning of the third semester. With departmental approval, statistics or chemistry may also satisfy the tool requirement. Although the program does not require a thesis, students will be expected to produce at least one research paper of publishable quality during the course of study. Students must also successfully pass the written Master's Comprehensive Examination in anthropology.

Master of Arts with a concentration in museum studies (offered in cooperation with the American Studies Program and Art Department)—See pages 384–86.

Departmental prerequisite: Anth 1–2 is prerequisite to all other courses in anthropology. This prerequisite may be waived by permission of instructor.

First Group

1–2 **Introductory Anthropology** (3–3) Staff

Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior. (Anth 1 and 2—fall and spring)

Second Group

*115 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen, Langran

Field study in Mexico. Intensive analysis of Mesoamerican culture history. (Summer)

150 **Comparative Value Systems** (3) Krulfeld

World views, conceptual systems, and value orientations of representative cultures throughout the world. (Spring, odd years)

151 **Primitive Economics** (3) Krulfeld

Comparative study of various economic organizations, including hunters and gatherers, herders, and cultivators. (Spring, odd years)

152 **Man, Culture, and Environment** (3) Humphrey

Basic principles of cultural ecology. Human interaction with the ecosystem both past and present; emphasis on the application of anthropological precepts to current environmental problems. (Spring, odd years)

153 **Psychological Anthropology** (3) McKay

Relevance of psychological theories to human evolution and the cross-cultural study of personality. Cultural determinants of personality formation and mental health. (Fall)

154 **Mythology and Folklore** (3) Golla

Traditional verbal expression of supernatural or social beliefs; metaphorical thought; verbal art. (Fall)

155 **Primitive Religion** (3) Simons, Golla

Conceptions of the supernatural in nonliterate societies. Religious beliefs and practices. Emphasis on religious process and change. (Spring)

156 **Comparative Political and Legal Systems** (3) Simons

Cross-cultural study of ancient and modern systems of social control; moral, ethical, and legal factors which operate to produce behavioral norms. (Spring)

157 **Primitive Social Organization** (3) Simons

Analysis of the social organization of primitive peoples; kinship, economic, and political systems. (Fall)

158 **Art and Culture** (3) Krulfeld, Humphrey

The art of tribal society, including the role of art in culture, influences upon the artist, and beliefs and practices associated with art production. (Fall or spring)

* Joint offering of the Anthropology Department, the American Studies Program, and the Department of Geography and Regional Science.

159 **Ethnography of Knowledge** (3) Golla

The organization of empirical knowledge in literate and nonliterate societies. Processes of hypothesis, deduction, and classification. (Fall, odd years)

161 **Language and Culture** (3) Golla

Structure and semantics of systems of human communication; linguistic change; social aspects of language. (Fall)

162 **Linguistics in Anthropology** (3) Golla

Introduction to general (descriptive and comparative) linguistics. (Spring)

170 **Cultures of the Caribbean** (3) Lewis

Culture history and ways of life among the area's various cultural groups up to the ethnographic present. (Spring, even years)

171 **Native Peoples of North America** (3) Simons, Humphrey

Comparative study of Indian groups representative of each of the continent's culture areas. (Fall)

172 **Native Peoples of South America** (3) Staff

Survey of Indian groups representative of each of the continent's culture areas. Hacienda, plantation, and urban adaptations of Indian and African groups. (Fall, even years)

173 **Cultures of the Pacific** (3) Lewis

Culture history and ways of life among native peoples of Melanesia, Micronesia, and Polynesia. (Fall, even years)

174 **Far Eastern Communities** (3) Krulfeld

Social organizations, religions, economies, and problems of current anthropological interest of Far Eastern cultures, including Japan, Korea, China, and India. (Fall, even years)

175 **Cultures of Southeast Asia** (3) Krulfeld

Representative Southeast Asian cultures from nonliterate societies to high civilizations. (Fall, odd years)

176 **Cultures of the Circumpolar Region** (3) Humphrey

Survey of the social and economic adaptations to an extreme climate made by peoples of the northern subarctic and arctic regions of North America and Eurasia. (Spring)

177 **Cultures of the Near East** (3) Lewis

Geographic environment, language, religion, and social structure of settled and nomadic peoples of the Near East; emphasis on the Arab world. (Spring, odd years)

178 **Cultures of South and East Africa** (3) Lewis

Comparative examination of the history, cultural development, and contemporary problems of southern and eastern African cultures. (Fall, odd years)

179 **Cultures of West and Central Africa** (3) Lewis

Comparative examination of the history, cultural development, and contemporary problems of western and central Africa, cultures. (Spring, even years)

182 **New World Archeology** (3) Humphrey
Introduction to archeological methodology, theory, and survey of North American culture history from human entry into the Americas during the Pleistocene period until the time of the first European contacts. (Spring)

183 **Old World Prehistory** (3) Brooks
Specific area and periods to be announced in the *Schedule of Classes*. Survey of human prehistory in Europe, Africa, and Asia from the earliest hominid cultures to the beginnings of advanced civilizations and their secondary centers. May be repeated for credit with permission of instructor. (Fall)

184 **Ethnohistory** (3) Stuart
Cultural reconstruction of behavioral and ideological patterns of past societies. Specific cultural area to be announced in the *Schedule of Classes*. (Spring)

185 **Latin American Archeology** (3) Humphrey, Stuart
Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest, emphasizing the origin and development of Latin American high civilizations. (Spring, odd years)

186 **Physical Anthropology of Modern Man** (3) Angel
Individual and social biology, methods, and techniques. Genetic, cultural, and ecologic backgrounds of individual and population variation: micro-evolution, growth, paleodemography, paleopathology, forensic identification, techniques. (Spring)

187 **Introduction to Hominid Evolution** (3) Brooks
The fossil record of hominid evolution considered in the light of evolutionary theory. Brief review of the earlier human antecedents, with concentration on the Pleistocene remains. (Spring, odd years)

188 **Primatology** (3) Brooks
Physical and behavioral characteristics of the various primate groups and their relationship to human physical and cultural evolution. Frequent meetings at the National Zoological Park. (Fall, odd years)

189 **Human Sexuality** (3) Staff
Evolutionary basis of sex-role behavior and cross-cultural solutions to human sexuality problems. (Summer)

192 **Anthropological Theory** (3) Krulfeld, Brooks
Theoretical postulates and assumptions underlying the development of modern cultural anthropology. (Fall and spring)

193 **Anthropological Methods** (3) Krulfeld, Lewis
Approaches to library and field research. Conceptual bases and biases in the delineation of problems; in the selection, analysis, and organization of data; and in the preparation of the final report. Strongly recommended, though not required, for all graduate students (Spring, odd years)

195 **Undergraduate Research** (arr.) Staff
Individual research problems to be arranged with a member of the faculty. May be repeated for credit. (Fall or spring)

Third Group

202 **Seminar: Recent Trends in Anthropology** (3) Krulfeld

Major topics of interest in contemporary anthropology since the mid-20th century will be taken up in order, stressing current journal and monograph materials. (Spring, odd years)

*211 **Seminar: Problems in Conservation** (3) Rose

Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

*212 **Advanced Conservation Techniques** (3) Staff

Physical stucture, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying techniques used to conserve these materials. Prerequisites: Art or Anth 293, Chem 50 and permission of instructor. (Fall)

†215 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen, Langran

Field study in Mexico. Directed individual research in the history of Mesoamerican culture. (Summer)

‡254 **Seminar: Folklore in America** (3) Golla

Various aspects of American traditional culture, including the theory and methodology of folklore research. Primary emphasis on Anglo- and Afro-American traditional cultures, with some consideration of other ethnic groups. (Summer)

255 **Seminar: Teaching Anthropology through Washington's Resources** (3) Staff

Examining current research and innovative classroom techniques, combined with field trips to area museums, laboratories, and zoos. Designed for secondary school anthropology teachers. (Summer)

261 **Seminar: Anthropological Linguistics** (3) Golla

Anthropological study of language—dialectology, ethnosemantics, descriptive and comparative studies of exotic languages. Specific topic to be announced in the *Schedule of Classes*. (Spring)

262 **Seminar: Applied Anthropology** (3) Lewis, McKay

Use of anthropological methods and techniques in such specific fields as government, community development, land reform, law, and medicine. (Fall)

263 **Seminar: Culture Contact and Change** (3) Simons

Change in Western and non-Western cultures: emphasis on general processes of change and interaction between simpler and more complex societies. (Fall)

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* Joint offering of the Anthropology and Art Departments
† Interdepartmental course offered by the American Studies Program and the Departments of Anthropology and Geography and Regional Science.
‡ Joint offering of the Anthropology Department and the American Studies Program.

264 **Seminar: Museum Techniques** (3) Humphrey
Principles of anthropological collection, classification, preservation, identification, interpretation, and exhibition of specimens; research and instructional use of the museum. Field trips to area museums. (Fall)

265 **Seminar: Method and Theory in Archeology** (3) Humphrey, Brooks
Analysis of field techniques, dating methods, and theoretical approaches to reconstructing and interpreting the cultures of the past, utilizing the most recent archeological techniques. (Spring)

266 **Seminar: Technology** (3) Humphrey, Lewis
Cross-cultural examination of the form, function, meaning, and use of material culture and the behavior patterns involved in its production. (Spring, odd years)

267 **Seminar: Economic Anthropology** (3) Krulfeld
Comparative study of systems of production, distribution, and consumption. (Fall)

268 **Seminar: Peasant Society** (3) Krulfeld
Cross-cultural analysis of peasant societies, including their manner of functioning within their larger social, economic, and cultural context. (Fall)

269 **Seminar: Structural Problems** (3) Simons
Comparative survey of principles of descent, kinship terminology and formation of descent groups; problems of variation and change in kinship systems and development of kinship models. (Spring)

*270 **Seminar: Museum Exhibiting** (3) Mahoney
Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition, problems of museum communication and education. Taught at the Smithsonian Institution. (Fall)

272 **Seminar: Topics in Latin American Anthropology** (3) Staff
Research topic selected from among peasant movements, ethnic groups, land reform, urbanization, archeological problems. (Spring)

273 **Seminar: Urban Anthropology** (3) McKay, Hertz
Anthropological investigations of city life from Neolithic beginnings to the present. Study of occupational, class, and ethnic communities within cities as well as ethnographies of entire cities. Adaptation of traditional field methods to urban settings. (Spring)

274 **Seminar: Afro-American Culture** (3) McKay
An ethnographic survey of racial, linguistic, and cultural attributes of Americans of African ancestry. African antecedents, conditions of migration, experiences in slave and free communities over their 350-year history in the U.S. (Spring, even years)

282 **Seminar: Advanced Archeology—New World Prehistory** (3) Humphrey, Stuart
Current archeological problems relating to the origin and develop-

* Joint offering of the Anthropology Department and the American Studies Program.

ment of aboriginal cultures. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall)

283 **Seminar: Topics in Old World Anthropology—Physical Anthropology and Archeology** (3) Brooks

Current problems in relation to materials from the old world. Specific area to be announced in the *Schedule of Classes*. (Spring, odd years)

287 **Seminar: Problems in Latin American Civilization** (3) Staff

Interdisciplinary seminar partially guided by a specialist within the methodology of his or her chosen discipline; each student writes a report on some aspects of a selected key theme. Admission by permission of instructor. (Spring)

290 **Advanced Museum Research** (3) Staff

Supervised individual research and/or field work at the Smithsonian Institution or other area museums, arranged in consultation with the museum and the Anthropology Department. Admission by permission of the department chairman. May be repeated for credit. (Fall and spring)

291 **Seminar: Museology** (3) Wright

Twentieth century development of museums—natural history, science, and history; their history, philosophy, and organization; their civic importance and administrative problems. (Spring)

*292 **Introduction to Conservation** (3) Rose

Method and theory of conservation, including fine arts, ethnographic archeological and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall class is only open to conservation students and those who will be registered for Anth 293 in the spring. The summer course deals with conservation of archeological materials. (Fall, spring, and summer)

*293 **Conservation Laboratory Techniques** (3) Rose

Examination procedures and analytical techniques used in the conservation laboratory, including discussion of chemical composition of solvents, adhesives, coating, and filling materials used in the restoration and stabilization of museum specimens. Prerequisite: Anth 292, Chem 13 or equivalent. Taught at the Smithsonian Conservation Laboratory. Admission by permission of instructor. (Spring)

†294 **Field Research in Historical Archeology** (3)

Field techniques, including excavation, recording, photography, preservation, laboratory analysis, and interpretation, supplemented by seminars on the history, ethnography, and ethnohistory of 17th century St. Mary's City, Md.

295 **Research** (arr.) Staff

May be repeated for credit. (Fall and spring)

* Interdepartmental course offered by the Departments of Anthropology and Art.

† Joint offering of the Anthropology Department and the American Studies Program, in cooperation with St. Mary's College, the Smithsonian Institution, and the St Mary's (Md.) City Commission.

299–300 Thesis Research (3–3) **Staff**
(Fall and spring)

ART

Professors W.A. MacDonald, L.P. Leite *(Emeritus)*, F.S. Grubar
Professorial Lecturers **Grace Evans, D.A. Brown**
Associate Professors D.H. Teller, L.F. Robinson *(Chairman)*
Adjunct Associate Professor **Grose Evans**
Associate Professorial Lecturer B.S. Glassman
Assistant Professors H.I. Gates, W.T. Woodward, F. Griffith, J.F. Wright, Jr., J.L. Lake, A.H. Smith, T. Ozdogan, J.C. Anderson, D.M. Hitchcock, **C.C. Costigan, B. Von Barghahn**
Assistant Professorial Lecturers E.L. Battaglia, E.P. Lawson, B.D. Lourie, D. Dawson, C.R. Rose, H.H. Hudgins, Jr., S.B. Molina, A. Seremetis
Lecturers **K. Montgomery, J. Morrell, Jr.**
Special Lecturer **L. Miller**

Bachelor of Arts with a major in art history (departmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 73–74, 80–86. **(Students should consult the departmental adviser regarding courses to be taken in satisfying the requirement for meaningful initiation into the social studies and the natural and mathematical sciences.)**

2. Prerequisite courses—Art 31–32 or 71–72.

3. Required courses in related areas—Art 137; Fren 1–2, 3–4, or Ger 1–2, 3–4; Phil 162; or equivalent. **(A reading knowledge of French or German is to be acquired as soon as possible. Students who plan to do advanced work in classical archeology or medieval art are also advised to study Greek and Latin.)**

4. Required courses in the major—Art 101 or 102, 104 or 105, 106 or 107, 108, 109, 110, 112, 113 or 114, 117, 118 or 119; nine additional semester hours in **second-group art history courses.**

5. A maximum of nine semester hours in Fine Arts, including Art 137, **is permitted.**

Art history majors may apply for graduation with Special Honors. In order to be accepted into this program, students must satisfy the general requirements (pages 50–51). They should apply in writing to the chairman of the Department of Art at the beginning of their senior year. Before admittance to the program, they must pass a reading examination administered by the department in either French or German. Upon acceptance, candidates will be assigned to one or more faculty advisers under whose direction they will undertake a supervised program of selected reading on which they will be required **to submit written, critical reports.**

The Art Department has established a program of study in affiliation with private art galleries in the Washington area. This program is open to a limited number of qualified undergraduate students. For details, consult the chairman **of the department.**

Bachelor of Arts with a major in Fine Arts (departmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 73–74, 80–86. **(Students should consult the departmental adviser regarding courses to be taken in satisfying the requirement for meaningful initiation into the social studies and the natural and mathematical sciences.)**

2. Prerequisite courses—Art 21–22, 41–42 (students concentrating in photography substitute Art 23–24 for 41–42).

3. Required courses in related areas—Art 31–32; six additional semester hours in second-group art history courses.

4. Required courses in the major—27 semester hours of first- or second-group Fine Arts courses in seven areas—ceramics, design, drawing, graphics, painting, photography and sculpture. Students choose one of these areas as a primary area of concentration, in which 12 semester hours are required. The remaining 15 semester hours must be distributed among the other areas, but only in the primary area can work taken amount to 12 semester hours. (Transfer students must take at least 12 semester hours of second-group Fine Arts courses in residence at this University, no matter how much advanced standing in Fine Arts is granted upon admission.)

Fine Arts seniors may apply for graduation with Special Honors. To be accepted into this program, students must satisfy the general requirements (see pages 50–51). They should apply in writing to the chairman of the Art Department at the beginning of their senior year. Upon acceptance, each candidate will be assigned one or more faculty advisors under whose direction a project in a special area of interest will be undertaken. Upon completion of the project, the student will present a one-man exhibit, of material prepared outside of class, subject to the examination of an Honors Board.

Bachelor of Arts with a major in classical archeology and anthropology (departmental)—An interdepartmental major offered by the Art and Anthropology Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult a departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Prerequisite course—Anth 1–2.

3. Required courses in the major—Anth 152, 158, 177, 183; Art 101, 102, 103, 111; Hist 109, 110. (A reading knowledge of French and German is recommended.)

Bachelor of Arts with a major in classical archeology and classics (departmental)—An interdepartmental major offered by the Art and Classics Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult a departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.

3. Required courses in the major—Art 101, 102, 103, 111; Hist 109, 110; 14 semester hours of second-group courses in Greek or Latin, including Clas 138. A reading knowledge of French and German is recommended.)

Master of Arts in the field of art history—Prerequisite: a Bachelor of Arts degree with a major in art history from this University, or an equivalent degree. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

1. *With a concentration in classical art and archeology, American art, Renaissance and Baroque art, and contemporary art*—Required: the general requirements, pages 89–97. As many as possible of the 30 semester hours of course work should be third-group courses, not more than six hours may be taken in museum-related courses. The courses must be completed in six semesters or less, with a grade of *A* in at least six semester hours of work, and with an overall quality-point index of at least 3.25. A reading knowledge examination, preferably in German or French, must be passed after completing nine

semester hours of course work. A general written Master's Comprehensive Examination on problems in the field of art history and a written thesis (equivalent to six semester hours) embodying the results of research on some specific topic in the history and theory of art are also required. For details, consult the chairman of the department.

2. *With a concentration in museum training*.–Required: the general requirements, pages 89-97. The program of study consists of 42 semester hours of work as follows: 12 hours of art history courses (taken before acceptance to degree candidacy, see below); Art 201-2, 271-72; and 18 additional hours of art history courses selected in consultation with the adviser; not more than six hours may be taken in museum-related courses. Grades of *A* are required in at least two courses, and an overall quality-point index of at least 3.25 must be maintained. A reading knowledge examination in German or French must be passed after completion of nine semester hours of coursework. For details, consult the chairman of the department.

Acceptance in this program as a degree candidate is provisional, pending the satisfactory completion of 12 semester hours of graduate art history courses (this requirement will be counted toward the total semester hours required for the degree). Upon completion of these courses the student must make formal application in writing for degree candidacy to the joint George Washington University National Collection of Fine Arts Committee on Museum Training. The application should state the reasons and aims for seeking this degree, and the student should submit letters of recommendation with the application. A personal interview will also be required.

The Art Department also has established a program of study in affiliation with the Textile Museum, the Corcoran Gallery of Art, the African Museum, the Hirshhorn Museum and Sculpture Garden and private art galleries. Students wishing to earn graduate credit in this program should consult the chairman of the department.

3. *With a concentration in museum administration*.–For details consult the chairman of the department.

Master of Arts in museum studies (offered in cooperation with the American Studies Program and the Anthropology Department).–See pages 384-86.

Master of Arts in the field of classical archeology, classics, and history (*an interdepartmental degree program offered by the Departments of Art, Classics, and History*).–Prerequisite: A bachelor's degree with a background in classical archeology and either Greek or Latin. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 89-97. The program of study consists of 24 semester hours of course work (as many as possible should be third-group courses) selected in consultation with the appropriate adviser from the Departments of Art, Classics, and History; plus a thesis (equivalent to six additional semester hours). Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

Master of Fine Arts in the field of ceramics, design, graphics, painting, photography, or sculpture.–Prerequisite: a Bachelor of Fine Arts or a Bachelor of Arts degree with a major in Fine Arts in the field of ceramics, design, drawing, graphics, painting, photography, or sculpture. A 3.00 undergraduate grade-point average (on a 4.00 scale) and departmental approval of the applicant's portfolio is required. The portfolio should include at least 10 drawings, including figure studies, and four to six paintings, prints, sculptures, ceramics, or photographs. If shipping is difficult, slides may be submitted in place of the works them-

selves. Students planning to do graduate work in graphics or painting must have completed 12 semester hours of drawing at the undergraduate level before admittance to the master's program.

Required: the general requirements, pages 89 97. As a tool requirement Master of Fine Arts candidates must take Art 137 or three additional hours of coursework selected in consultation with the advisor. As many as possible of the remaining 24 hours of coursework should be in third-group courses, only 18 hours of which may be in one area; the remaining six hours are to be selected from related areas in consultation with the advisor. A written Master's Comprehensive Examination is required in the theory, techniques, and history of the major field, with two-thirds devoted to theory and history and one-third devoted to techniques. After successful completion of the comprehensive examination, a creative thesis consisting of the execution of original works of art in ceramics, design, graphics, painting, photography, or sculpture will be completed under the supervision of a thesis advisor. In addition, the thesis must include a written statement and analysis of artistic purpose, subject to the approval of the thesis advisor and a second faculty reader. A representative portion of the work illustrating the creative thesis may be retained by the University at the discretion of the thesis director in agreement with the second reader. For details, consult the chairman of the department.

Students wishing to earn graduate credit in exhibition and display design should consult the chairman of the department.

Doctor of Philosophy in the field of art history Required: the general requirements, pages 89 91, 97 99, and a Master of Arts degree in art history. Candidates must also pass written examinations in French and German or any other appropriate foreign language, a General Examination in art history, an examination in the area of specialization, and examinations in two areas related to the area of specialization. Students plan their own programs in consultation with a departmental committee.

Areas of Specialization: classical art and archeology, Medieval art, Renaissance art, Baroque art, eighteenth century art, nineteenth century art, twentieth century art, and American art.

Bachelor of Arts in Education with a teaching field in art Prerequisite: the Education curriculum, pages 112–13.

Required: the art option and professional courses listed on pages 115 16.

ART HISTORY

First Group

1 **Introduction to Art** (3) Von Barghahn and Staff

General principles, theories, and techniques. (Fall, spring, and summer)

31–32 **Survey of Western Art** (3–3) Robinson and Staff

A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art. (Art 31 and 32—fall and spring)

71–72 **Introduction to the Arts in America** (3–3) Grubar and Staff

Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present. (Art 71 and 72—fall and spring)

Second Group

101 **Greek Architecture or Roman Architecture** (3) MacDonald
(Fall)

102 **Greek Sculpture or Roman Sculpture** (3) MacDonald
(Spring)

103 **Classical Iconography** (3) MacDonald
Origin and development of myths in classical art.

104 **Renaissance Art in Italy I** (3) Grace Evans, Anderson
Early developments from the 13th to the 15th century. (Fall)

105 **Renaissance Art in Italy II** (3) Grace Evans
High Renaissance and Mannerism. (Spring)

106 **Renaissance Art in the North I** (3) Hitchcock
Northern painting from van Eyck through the Antwerp Mannerists
(Fall)

107 **Renaissance Art in the North II** (3) Hitchcock
Northern painting and graphics from Dürer through Brueghel.
(Spring)

108 **18th Century Art in Europe** (3) Hitchcock
(Spring)

109 **19th Century Art in Europe** (3) Robinson
(Fall and spring)

110 **Contemporary Art** (3) Robinson
(Fall and spring)

111 **Classical Archeology** (3) MacDonald
Archeological monuments of classical civilizations, with intensive study of one or more areas selected from architecture, sculpture, painting, or minor arts.

112 **Art of Egypt and the Ancient Orient** (3) MacDonald
Study of the art of Mesopotamia, Anatolia, Egypt, and Persia.
(Spring)

113 **Baroque Art in Italy** (3) Grose Evans
(Spring)

114 **Baroque Art in the North** (3) Hitchcock
Holland, Flanders, Spain, France, Germany, and England. (Fall)

115 **Christian Iconography** (3) Anderson
Origins and development of Christian symbols and themes from early Christian to modern times.

116 **Islamic Art** (3)

117 **Medieval Art I** (3) Grace Evans, Anderson
Early Christian and Byzantine. (Fall)

118 **Medieval Art II** (3) Grace Evans, Anderson
Romanesque and Gothic. (Spring)

119 **Pre-Romanesque Art in the North** (3) Grace Evans, Anderson
Merovingian and Carolingian. (Spring)

120 **Art of China and Japan** (3) Von Barghahn
(Fall)

121 **Spanish Painting from the Catalan Frescoes through El Greco** (3) Von Barghahn

122 **History of Spanish Painting from Ribera through Goya** (3) Von Barghahn

129–30 **Principles of Museum Work** (3–3) Lawson
Introduction to the history and development of museums: problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service. (Academic year)

140 **Gothic Architecture** (3) Staff

147 **Pre-Columbian Art** (3) Staff

148 **19th Century American Painting** (3) Grubar, Grose Evans
(Fall)

149 **19th Century American Sculpture** (3) Grubar
(Spring)

150 **Landmarks in American Art** (3) Grubar

155 **Etruscan Art and Archeology** (6) MacDonald
Offered off campus through the College of General Studies.

156 **Early Medieval Sculpture** (3) Evans

161 **Monuments of Christian Rome** (3) Anderson

162 **The Art of Oriental Rugs** (3) MacDonald

165 **African Art** (3) Lamp

167 **French Painting: 15th and 16th Centuries** (3) Von Barghahn

169–70 **History of Furniture** (3) Wasserman
Art 169: beginning to 1800; Art 170: 1800 to the present.
(Academic year)

Third Group

201–2 **Museum Projects** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the field of museum training.

203 **Primitive Art** (3) Staff
(Spring)

207 **Modern Architecture** (3) Miller
Europe and America. (Fall)

*211 **Seminar: Problems in Conservation** (3) Rose
Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite: Art or Anth 212. (Fall)

*212 **Advanced Conservation Techniques** (3) Staff
Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying the techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of the instructor. (Fall)

213 **Museum Administration and Government** (3) Staff

214 **Museum Administration and Trusteeship** (3) Staff

216 **Medieval Painting** (3) Grace Evans
Painting and the decorative arts.

217–18 **Problems in Museum Work** (3–3) Staff

†220 **Seminar: Baroque Art of the 17th Century** (3) Hitchcock
A reading knowledge of Italian is desirable for the Italian area and German for the northern area. (Spring)

†221 **Seminar: Renaissance Art** (3) Staff
A reading knowledge of French, German, or Italian is desirable, depending on the specific area. (Fall and spring)

242 **Etruscan Art and Archeology** (6) MacDonald
Offered off campus through the College of General Studies.

†243 **Seminar: American Art** (3) Gruber
(Fall and spring)

†244 **Seminar: 19th Century European Art** (3) Robinson
Reading knowledge of French desirable.

†245 **Seminar: 20th Century European Art** (3) Staff

†246 **Seminar: Classical Art** (3) MacDonald

†247 **Seminar: Medieval Art** (3) Grace Evans, Anderson

248 **Independent Research in Art History** (3) Staff
(Fall and spring)

261 **Seminar: Problems in Art History** (3)
Recommended for art history majors; open to limited number of qualified undergraduates, with permission of instructor. Theory, criticism, or methodology of art history. May be repeated for credit. Topic to be announced in *Schedule of Classes*. (Fall and spring)

* Joint offering of the Art and Anthropology Departments.
† Specific area announced in the *Schedule of Classes*. May be repeated for credit if the specific area covered is different.

271–72 **Museum Techniques** (3–3) Staff

Open only to candidates for the degree of Master of Arts in the fields of museum training and museum studies. Practical work to be determined by Museum Training Committees at the institutions involved. (Academic year)

*284 **Seminar: Studies in American Art and History** (3) Staff

Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. (Spring)

289–90 **Thesis Research** (3–3) Staff

(Fall and spring)

†292 **Introduction to Conservation** (3) Rose

Method and theory of conservation, including fine arts, ethnographic, archeological, and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall section is open only to conservation students and to those who plan to register for Art 293 in the spring. (Fall and spring)

†293 **Conservation Laboratory Techniques** (3) Rose

Discussion (2 hours), laboratory (8 hours). Examination procedures and analytical techniques used in the conservation laboratory, including discussion of chemical composition of solvents, adhesives, coating, and filling materials used in the restoration and stabilization of museum specimens. Taught at the Smithsonian Conservation Laboratory. Prerequisite: Anth 292, Chem 13. (Spring)

Fourth Group

Limited to art history doctoral candidates. Offered as the demand requires.

‡385–86 **Readings in Art History** (3–3)

‡398 **Advanced Reading and Research** (arr.)

For students preparing for the doctoral examination.

‡399 **Dissertation Research** (arr.)

FINE ARTS

Unless otherwise indicated, Fine Arts courses taught in University studios carry no material or laboratory fees; students must purchase their own materials.

Departmental prerequisite: Art 21–22 and 41–42 (students concentrating in ethnography substitute Art 23–24 for 41–42) or permission of department chairman is prerequisite to all other studio courses in art.

* Joint offering of the Art Department and the American Studies Program in affiliation with the National Portrait Gallery of the Smithsonian Institution.
† Interdepartmental course offered by the Art and Anthropology Departments.
‡ May be repeated for credit.

First Group

*21–22 **Design I: Basic** (3–3) Costigan, Teller

Fundamental studies of principles and elements of design. Art 21: study of two-dimensional design. Art 22: three-dimensional studies. **Art 21: Laboratory fee, $10. Art 22: Laboratory fee, $15.** (Art 21 and 22—fall and spring)

23–24 **Fundamentals of Photography** (3–3) Lake

Fundamental techniques of photography; emphasis on creative expression. Laboratory fee, $35 a semester. (Art 23 and 24—fall and spring)

41–42 **Drawing I** (3–3) Wright

Concepts of drawing, traditional and contemporary; training in perception, analysis of form, use of media, and exercises in connoisseurship. Material and model fee, $15 a semester. (Art 41 and 42—fall and spring)

51–52 **Ceramics I** (3–3) Ozdogan

Working with clay as an art form. Basic techniques of handbuilding, kiln-firing, clay and glaze making. Laboratory fee, $45 a semester. **(Academic year)**

57–58 **Graphics I** (3–3) Griffith, Wright

Exploration of the methods of intaglio, relief, printing, and other composite processes. Material fee, $20 a semester. **(Academic year)**

61–62 **Water Color (3–3)**

Painting in transparent and opaque water color and in acrylic. Experimentation, figurative and landscape. (Academic year)

65–66 **Painting I** (3–3) Smith

Emphasis on personal expression with exposure to a variety of styles and attitudes. Use of acrylic and oil. Material fee, $12 a semester. **(Academic year)**

81–82 **Sculpture I** (3–3) Gates

Three-dimensional design. Basic sculptural techniques; modeling, carving, and construction. Media include wood, clay, stone, plaster. **Laboratory fee, $15 a semester. (Academic year)**

Second Group

Second-group art courses may be repeated for credit with approval of department. Staff

123–24 **Design II: Individual Problems** (3–3)

Emphasis on the individual student and the problems and materials of specific interest in any area of design. Laboratory fee, $5 per semester hour of credit. **(Academic year)** Smith

†125–26 **Painting II** (3 or 6–3 or 6)

Emphasis on personal expression; exposure to a variety of styles and

* **Required of all Fine Arts majors.**
† Fine Arts majors and Master of Fine Arts candidates should elect six semester hours of credit

attitudes. Materials and techniques subordinate to individual experimentation. Use of acrylic and oil. Material fee each semester: $12 for 3 semester hours; $24 for 6 semester hours. (Academic year)

*127–28 **Painting III** (3 or 6–3 or 6) Woodward

Exploration of problems in developing a personal visual imagery. Material fee each semester: $12 for 3 semester hours; $24 for 6 semester hours. (Academic year)

*131–32 **Ceramics II** (3 or 6–3 or 6) Ozdogan

Continuation of basic ceramic building techniques and laboratory activities. Introduction to basic wheel-throwing. Laboratory fee, $45 per semester. (Academic year)

133 **Ceramic Decoration** (3 or 6) Ozdogan

Aesthetic and technical development of surface decoration with experimental projects in sgraffito, mishima, engobe, majolica, underglaze, overglaze, and relief techniques. Laboratory fee: $45 for 3 semester hours; $60 for 6 semester hours.

134 **History of Photography** (3) Staff

(Spring)

135–36 **Advanced Water Color** (3–3)

Development of techniques of water color; concentration on special projects. (Academic year)

137 **Workshop in Materials, Methods, and Techniques** (3) Woodward, Smith

Technical investigation of painting methods from the 14th century to the present. Preparation of grounds, media, underpainting, glazing. Laboratory fee, $12. (Fall and spring)

138 **Graphics: History and Practice** (3) Griffith

Laboratory fee, $15.

139 **Fiber and Textile Workshop** (3)

141 **Interior Design** (3) Teller and Staff

142 **House Planning** (3) Staff

143–44 **Serigraphy** (3–3) Teller

Advanced problems in serigraphy: emphasis on its aesthetic possibilities. Prerequisite: Art 57 58. Laboratory fee, $15 a semester. (Academic year)

146 **Ceramic Restoration and Conservation** (3) Ozdogan

All methods and techniques. Student projects include surface and structural repairs with laboratory tests and activities. Laboratory fee, $45.

*151–52 **Ceramics III** (3 or 6–3 or 6) Ozdogan

Developing quality and creativity with emphasis on achieving high standards of craftsmanship in handbuilding and wheel-throwing. Laboratory tests and activities. Laboratory fee, $45. (Academic year)

* Fine Arts majors and Master of Fine Arts candidates should elect six semester hours of credit.

*153–54 **Graphics II** (3 or 6–3 or 6) Griffith, Wrigh...
Advanced relief, intaglio, and other composite processes. Prerequisite: Art 57–58. Material fee each semester: $20 for 3 semester hours; $40 for 6 semester hours. (Academic year)

*157–58 **Graphics III** (3 or 6–3 or 6) Griffith
Exploration of combined techniques and mixed media. Prerequisite: Art 153–54. Material fee each semester: $20 for 3 semester hours; $40 for 6 semester hours. (Academic year)

159–60 **Drawing II** (3–3) Wright
Development of drawing. Individual study, application and extensions of drawing. Material fee, $20 a semester. (Academic year)

163–64 **Design: Visual Communication I** (3–3) Molina
Layouts and execution in client-presentation form of various graphic design projects—brochures, bookjackets, displays, title graphics for film media. Material fee, $20 a semester. (Academic year)

166 **Advanced Drawing Techniques** (3) Smith
Laboratory fee, $20.

171 **Typography I** (3) Molina
Techniques of hand lettering, traditional and contemporary. Exploration of the decorative potential in lettering. (Fall)

172 **Typography II** (3) Molina
Study of type classification, recognition, and adaption. Methods of copy fitting and type reproduction processes. Typographic layout and specification. (Spring)

174 **Design: Visual Communication II** (3)

175 **Lithography** (3)

177–78 **Survey of Printing and Illustration** (3–3)
Exposure to a maximum range of illustrative processes, both practical and theoretical. Technical aspects of commercial printing processes; methods of preparation of artwork, photographs, and typography; proofs for commercial reproduction. (Academic year)

*179–80 **Sculpture II** (3 or 6–3 or 6) Gates
Concepts of sculpture; new materials and developments. Laboratory fee for each semester: $15 for 3 semester hours; $30 for 6 semester hours. (Academic year)

181–82 **Intermediate Photography** (3–3) Lake
Basic problems. Introduction to color photography with emphasis on creative expression. Prerequisite: Art 23–24 or permission of instructor. Laboratory fee, $35 a semester. (Academic year)

183 **Intermediate Black and White Photography** (3)
Emphasis on role of ideas in black and white photography. Critiques designed to encourage development of an individual style. Prerequisite: Art 23–24 or permission of instructor. Laboratory fee, $5... (Fall and spring)

* Fine Arts majors and Master of Fine Arts candidates should elect six semester hours of cre...

185–86 **Painting and Drawing** (3–3)

Techniques of drawing and painting in oil, acrylic, and water color. Work from life model and still life.

*189–90 **Sculpture III** (3 or 6–3 or 6) Gates

Advanced study concentrating on relevance of scale and media. Relationship of sculpture to the environment. Laboratory fee for each semester: $15 for 3 semester hours; $30 for 6 semester hours. (Academic year)

193–94 **Film Making** (3–3)

Basic techniques and procedures in film making. Each student will create a short film. Art 193 is prerequisite for Art 194. (Academic year)

†195 **Documentary Photography** (3) Lake and Staff

Social problems, team-taught. Each student will work on projects with social dimensions. Laboratory fee, $35. Admission by permission of instructor. Limited enrollment. (Spring)

197–98 **History of Photography** (3–3)

Discussion, with slides of major figures and movements in the history of photography.

Third Group

All third-group art courses may be repeated for credit with the approval of the department.

205 **Advanced Photography** (3) Lake

Advanced problems in photography; emphasis on individual development. Prerequisite: Art 181–82 or permission of instructor. Laboratory fee, $35 a semester. (Fall and spring)

206 **Photography: Special Projects** (3) Lake

Laboratory fee, $35.

208 **Advanced Photography** (3)

Advanced problems in photography; emphasis on individual development. Prerequisite: Art 181–82 or permission of instructor. Laboratory fee, $30. (Fall and spring)

209–10 **Exhibition and Display Design** (3–3) Miller

*224 **Ceramic Sculpture** (3 or 6) Ozdogan

Principles of sculptural design in clay. Bibelot, garden ceramics, and figurative forms. Laboratory fee: $45 for 3 semester hours; $60 for 6 semester hours.

225 **Ceramic Restoration** (3)

Laboratory fee, $45.

*226 **Architectural Ceramics** (3 or 6) Ozdogan

Advanced studies in ceramic sculpture oriented toward architectural concepts. Laboratory tests and activities. Laboratory fee: $45 for 3 semester hours; $60 for 6 semester hours.

* Fine Arts majors and Master of Fine Arts candidates should elect six semester hours of credit
† Interdepartmental course offered by the Art and Journalism Departments.

*231–32 **Design III** (3 or 6–3 or 6) Gate

New media and techniques in three-dimensional design. Laborate fee, $15 a semester for 3 semester hours: $30 a semester for semester hours. (Academic year)

*234 **Design IV** (3 or 6) Staf

Presentation, model building, and specifications of materials in thre dimensional problems. (Fall and spring)

*235 **Design V** (3 or 6) Teller

Designing and executing textiles using the techniques of silk screen block print, and batik. (Fall and spring)

248 **Independent Research in Fine Arts** (3)

For master's degree candidates; open to limited number of qualifie undergraduates, with permission. Independent research arranged consultation with individual instructor and graduate adviser. May repeated for credit. (Fall and spring)

249 **Theory of Design** (3) Teller

Application of design principles to painting, architecture, sculptur and minor arts of today. Relationship of design principles to co temporary artists and their works. Open to undergraduate student with permission of instructor. (Fall)

251–52 **Ceramics IV** (3–3) Ozdogan, Corcoran Faculty

Advanced individual projects. Directed studies in specific areas Laboratory tests and activities. Laboratory fee, $45.

253 **Ceramics V** (3) Ozdogan

Establishment of an individual style and specialization. Emphasis on meeting professional standards. Laboratory tests and activities Laboratory fee, $45.

254 **Ceramic Glazes: Calculation and Formulation** (3) Glassman

Laboratory fee, $45.

*255–56 **Graphics IV: Serigraphy** (3 or 6–3 or 6) Teller

Prerequisite: Art 157–58. Laboratory fee each semester: $15 for semester hours; $30 for 6 semester hours. (Academic year)

*257–58 **Graphics V: Etching and Engraving** (3 or 6–3 or 6) Griffith

Prerequisite: Art 157–58. Material fee each semester: $20 for semester hours; $40 for 6 semester hours. (Academic year)

*259 **Graphics VI: Lithography** (3 or 6) Wright

(Fall and spring)

*260 **Graphics VII: Relief Printing** (3 or 6) Griffith

Material fee: $20 for 3 semester hours; $40 for 6 semester hours (Fall and spring)

*265–66 **Painting IV** (3 or 6–3 or 6) Woodward

Creative painting; students work on independent projects as well as

* Fine Arts majors and Master of Fine Arts candidates should elect six semester hours credit.

assigned problems. Material and model fee each semester: $12 for 3 semester hours; $24 for 6 semester hours. (Academic year)

267–68 **Individual Problems in Photography** (3–3) Lake and Staff

Instruction and professional guidance relevant to individual projects. Laboratory fee, $35 a semester. Prerequisite: Permission of instructor. (Academic year)

*275 **Painting V** (3 or 6) Woodward

(Fall or spring)

277–78 **Design: Advanced Visual Communication** (6–6) Molina

Design and execution of graphic design projects, including magazine spreads, posters, advertisements, trademarks, letterheads, packages. Psychological and symbolic aspects of design solutions. Laboratory fee, $30 each semester. (Academic year)

*279–80 **Sculpture IV** (3 or 6–3 or 6) Gates

Laboratory fee each semester: $15 for 3 semester hours; $30 for 6 semester hours. (Academic year)

*281 **Sculpture V** (3 or 6) Gates

Laboratory fee: $15 for 3 semester hours; $30 for 6 semester hours. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

ART THERAPY—GRADUATE STUDY

Professor B.I. Levy *(Program Director)*
Adjunct Assistant Professors H.Y. Kwiatkowska, E. Ulman *(Coordinator of Training)*
Assistant Professorial Lecturers E. Kramer, J. Krash
Clinical Instructors G.E. Powell, C.W. Wang, B.J. Clifford, E.J. Donnellan, S. Fishman, L. Gantt, G. Haugan, D.F. Mindlin, R.A. Wolff, M.S. Sehmal, B. Holly, Jr., M. Keshover, B. Zeiger

Master of Arts in the field of Art Therapy—Prerequisite: a bachelor's degree, evidence of significant training and/or experience in the arts, including painting, drawing, and clay modeling; course work in the behavioral and/or social sciences, including personality theory, abnormal psychology, and child psychology.

Required: the general requirements, pages 89–97. Prospective candidates should consult the brochure which describes the program for specific requirements.

Fields of emphasis: adult art therapy, family art therapy, child art therapy, and research.

201 **Introduction to Art Therapy** (3) Ulman

Lectures, presentation of illustrative case material, class discussion of assigned readings. Survey covering range of art therapy practice, diagnostic and treatment approaches, historical development, main theoretical trends. Open only to degree candidates. (Fall)

* Fine Arts majors and Master of Fine Arts candidates should elect six semester hours of credit.

202 **Case Studies in Art Therapy** (3) Ulman

Discussion of case material provided by students in order to refine methods of working, improve written and oral reports. Instructor and other practitioners may provide supplementary illustrative material. Assigned reading (Spring)

203 **Technique of Art Therapy** (3) Kwiatkowska

Art therapy approaches with individuals and groups of different diagnostic categories in various settings presented through illustrative clinical examples. Students experiment with numerous techniques through the use of art materials. Open only to degree candidates. (Fall)

204 **The Freudian Model in Art Therapy** (3)
Kramer, Kwiatkowska, Ulman

Concepts of instinctual drives; ego development; defense mechanisms; sublimation; transference and countertransference; maturation and regression applied to work with children, adults, families, and groups. (Spring)

205–6 **Family Art Techniques** (3–3) Kwiatkowska

Principles of family art therapy as adjunctive and primary treatment; art techniques for evaluation of family dynamics. Students participate in working with families. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Academic year)

207–8 **Art as Therapy with Children** (3–3) Kramer

Lectures, presentation of case material, studio work, class discussion of assigned reading. Special considerations of work in art therapy with children will be explored from the theoretical and practical standpoints. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Academic year)

211 **Survey of Art Therapy** (3) Staff

Use of visual arts to enhance personal development; history, theories, range of practice in art therapy. Illustrated lectures, reading, discussion, studio work. For students not intending to specialize in art therapy. Open to advanced undergraduates with permission of instructor. (Fall and spring)

218 **Seminar: Systems of Psychotherapy** (3) Silber

Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Spring)

275 **Group Art Therapy** (3) Staff

Learning about the contribution of art to group process by investigating experience as member and leader of an art-centered group. Prerequisite: ArTh 201 and 203, or permission of instructor. May be repeated for credit with advisor's approval. (Fall and spring)

283–84 **Practicum in Art Therapy** (3–3) Staff

Minimum of 300 hours' field work connected with service to clients. On-the-job supervision supplemented by group supervision from the art therapy staff. Prerequisite: ArTh 201 and 203, or 211. Open only to degree candidates.

285 **Special Projects in Art Therapy** (3) Staff

Individual work based on study, research, or practice. Details to be worked out with each student. Resource people may be called upon to assist, as appropriate. May be repeated for credit with approval of advisor.

290–91 **Workshops in Art Therapy** (3–3) Staff

Art therapists and other mental health professionals will conduct four weekend workshops during each semester. Emphasis on the elucidation of concepts of treatment through lecture, discussion, and participation. Students registered in the Art Therapy Program aid in selection of subjects and leaders. Students may register for either 290 or 291, or both. (Academic year)

ASTRONOMY

See **Physics.**

BIOCHEMISTRY

Professors C.R. Treadwell *(Chairman)*, B.W. Smith, G.V. Vahouny, J.M. Bailey
Associate Professor G.A. Walker
Assistant Professor L.L. Gallo

Master of Science in the field of Biochemistry– Prerequisite: a bachelor's degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Phys 1, 2.

Required: the general requirements, pages 89–97, including Bioc 221–22, 227, 299, 300. The remaining courses are to be selected from Bioc 224, 232, 241, 262, 295 or, with the approval of the advisor, from graduate courses in chemistry, microbiology, physiology or pharmacology. It is expected that students will complete all of the required work in approximately two years.

Doctor of Philosophy in the field of Biochemistry—Required: the general requirements, pages 89–91, 97–99.

Research fields: amino acid metabolism; animal nutrition; biochemical evolution; biochemistry of cancer; biochemistry of tissue culture; carbohydrate metabolism; chemistry and metabolism of carbohydrates, lipids, proteins; complex lipids; endocrinology; intermediary metabolism; lipids; metabolic relationships of insulin; metabolism; metabolism of connective tissue; metabolism of purines and pyrimidines; neurochemistry; nutrition; protein biosynthesis; protein metabolism; tissue respiration; and vitamins.

221–22 **General Biochemistry** (3–4) Vahouny, Gallo and Staff
(Formerly 3 or 4—4 or 5 credits)

A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Generally, graduate students *must* register concurrently for Bioc 223 and for Bioc 224. However, graduate students taking Bioc 225 26, ForS 281 82, Micr 241–42 or Phys 223–24 may register for Bioc 221 22 without the laboratory. With specific recommendations by the undergraduate advisor and the department, undergraduate students may register for Bioc 221 22 without laboratory. Prerequisite: Chem 152, 154. (Academic year)

223–24 **Biochemistry Laboratory** (1–1) Gallo and Staff
(Formerly Bioc 224 Biochemistry of Enzymes [1])
Laboratory complement of Bioc 221–22. Concurrent registration in Bioc 221-22 required. Materials fee, $20 a semester. (Academic year)

*225–26 **Biomedical Instrumentation** (4–4) Smith and Staff
Same as ForS 281 82, Micr 241 42 and Phys 223 24. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification and quantification of materials of interest to biomedical and forensic scientists. Laboratory fee, $50. (Academic year)

227 **Biochemistry Seminar** (1) Bailey
Current literature in biochemistry. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (1) E. Anderson
Two separate courses are offered in alternate years, each covering both general and advanced material: students may register for these in either order and cover the entire content in two years. The full content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 221. (Fall)

232 **Protein Chemistry I** (1) Steers, Schechter
(Formerly Proteins and Amino Acids I)
An introduction to the theory and methods of protein chemistry, including techniques of protein purification, sequencing and characterization by physico-chemical methods. Prerequisite: Bioc 221. (Fall)

233 **Protein Chemistry II** (1) Steers, Schechter
(Formerly Proteins and Amino Acids II)
Continuation of Bioc 232. The study of structure-function relations in proteins, including methods of analysis of conformation, enzymatic activity and the role of proteins in various biological processes. (Spring)

241 **Isotopes** (3) Burr
Theoretical characterization of isotopes and their application in biology and medicine. Attention given to counting, health physics and radiation safety, autoradiography, chromatography. Laboratory fee, $16. (Spring)

252 **Biochemistry of the Brain** (1) Staff
For medical students; open to limited number of graduate students. Recent biochemical developments in structure, functions, and metabolic processes unique to the brain. (Spring)

254 **Human Nutrition** (1)
For medical students; open to limited number of graduate students. Application of nutritional principles in humans. (Spring)

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* An interdisciplinary course offered by the Biochemistry, Forensic Sciences, Microbiology, and Physiology Departments.

256 **Biochemistry of Organ Function** (1) N. Kramer*

For medical students; open to limited number of graduate students. Emphasis on biochemical processes unique to particular organ systems; application of these processes to evaluation of function. (Spring)

260 **Biochemistry of the Steroids** (1) O. Dodek†

For medical students; open to limited number of graduate students. Basic chemistry of the steroids, pathways of biosynthesis and metabolism, regulatory mechanisms, physiologic effects, clinical measurements of endogenous steroids, clinical manifestations of steroid imbalance, steroid changes in pregnancy, and steroid therapy. (Spring)

262 **Biochemistry of the Lipids** (1) Vahouny

Discussion of topics of current interest, including digestion, energy production, biosynthesis, function in specialized tissues, and subcellular particles. Content differs each time course is offered; may be repeated for credit. (Spring)

266 **Biochemical Genetics and Inherited Metabolic Diseases** (1) C. Merril

For medical students; open to limited number of graduate students. Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. (Spring)

295 **Research in Biochemistry** (arr.) Staff

Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BIOLOGICAL SCIENCES

Professors A.H. Desmond *(Chairman)*, K.F. Parker *(Emeritus)*, S.O. Schiff
Adjunct Professors T.E. Bowman, M.L. Jones, L.S. Kornicker, H.A. Rehder, F.A. Chace, Jr., R. Manning, C.G. McWright
Professorial Lecturers K.C. Kates, R.S. Sigafoos, W.A. Shropshire, Jr.
Associate Professors D.L. Atkins, R.E. Knowlton, H. Merchant, R.K. Packer, T.L. Hufford

* Dr. Kramer is Associate Professor of Medicine in the School of Medicine and Health Sciences.
† Dr. Dodek is Assistant Clinical Professor of Obstetrics and Gynecology in the School of Medicine and Health Sciences.

Adjunct Associate Professors W.D. Hope, D.L. Pawson, J. Rosewater, C.F. Roper, M. Rice

Associate Professorial Lecturers P.E. Spiegler, J.C.C. Dickens, B.M. Timberlake

Assistant Professors R.P. Seifert, D.E. Johnson, A.L. Mescher

Assistant Professorial Lecturers D.A.P. Houston, B. Brown

Lecturers L.R. Townsend, J. Fowle III, D.L. Neugebauer

Bachelor of Arts or Bachelor of Science with a major in biology, botany or zoology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social studies and the humanities.)

2. Prerequisite courses—BiSc 11–12, or equivalent.

3. Required courses in related areas—Chem 11–12; Chem 151–52 and 153–54, or 50. (The following courses are strongly recommended: Math 31; Phys 1, 2; two years of French, German, or Russian; Stat 91.)

4. (a) Required courses for the major in biology—a minimum of 24 semester hours of second-group courses, which should include at least six hours in biology, six in botany, and six in zoology.

(b) Required courses for the major in botany—a minimum of 24 semester hours of second-group courses in botany or a combination of botany and biology.

(c) Required courses for the major in zoology—a minimum of 24 semester hours of second-group courses in zoology or biology.

Master of Science in the field of biology, botany, or zoology—Prerequisite: a bachelor's degree with a major in one of the following from this University, or an equivalent degree: (1) *Biology field*—an undergraduate major in biology, botany or zoology; (2) *Botany field*—an undergraduate major in botany or biology; (3) *Zoology field*—an undergraduate major in zoology or biology. The undergraduate program must have included the following courses, or equivalent: Chem 151–52 and 153–54, or 50; Math 31; Phys 1, 2.

Required: the general requirements, pages 89–97. The minimum requirement consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). With the permission of the department a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Doctor of Philosophy in the field of biology, botany or zoology—Required: the general requirements, pages 89–91, 97–99, plus satisfactory completion of a Preliminary Examination and the General Examination in four areas of biology. The program of study, fields of study, and tool subjects are determined in consultation with an advisory committee appointed for each candidate.

Research fields in Biology: cell physiology, cytogenetics, developmental genetics, and molecular genetics.

Research fields in Botany: photobiology, phycology, plant ecology, plant physiology (microorganisms), plant physiology (vascular plants), and taxonomy.

Research fields in Zoology: animal ecology, bioenergetics; comparative neuroanatomy; comparative physiology; herpetology; histophysiology; invertebrate zoology; marine biology; radiation biology; taxonomy, anatomy and physiology of mollusks; vertebrate anatomy and taxonomy; vertebrate embryology and morphogenesis; vertebrate ichthyology; and vertebrate physiology.

Bachelor of Arts in Education with a teaching field in biology—Prerequisite: the education curriculum, pages 111–12.

Required: the biology option and the professional courses listed on pages 115–16.

Departmental prerequisite: BiSc 11–12 or equivalent is prerequisite to all second-group courses in biology, botany and zoology, except by permission of the instructor.

BIOLOGY

First Group

3–4 Introductory Biology for Nonscience Majors (3–3) Schiff

Lecture (2 hours), laboratory (2 hours). Survey of biological principles; emphasis on man as a functional organism in the environment. Prerequisite to BiSc 4: BiSc 3. Material fee, $15 a semester. (Academic year)

11–12 Introductory Biology for Science Majors (4–4) Merchant

Lecture (3 hours), laboratory (3 hours). Biological principles and problems designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $18 a semester. (Academic year)

***26 Environmental Issues** (3) Langran, Schiff

An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy. (Fall and spring)

33 Plants, Man, and Life (3) Hufford

(Formerly BiSc 133)

Plants by which man lives and upon which he depends for his food, shelter, medicine, clothing, and industries, as well as his drugs and drinks. (Spring)

Second Group

103 Marine Biology (4) Knowlton

Lecture (2 hours), laboratory and field (3 hours), plus some extended field trips. Study of relationships between organisms and physical, chemical, and biological factors of the marine environment. Consideration of the open ocean and coastal eco-systems and man's influence on them. Recommended prerequisite: BiSc 101 or 102, 106, 140. Material fee, $20. (Spring)

107 Field Biology (6) Merchant

Field study of altitudinal zonation, species hybridization, territoriality, energy balance, time and energy budgeting, effects of exposure, and effects of introduction of alien species on flora and fauna of Great Smoky Mountains National Park. (Summer)

108 Organic Evolution (3) Seifert

Synthetic theory of organic evolution including treatment of speciation, adaptive radiation, biogeography, population biology, sociality, and human evolution. (Spring)

* Offered jointly by the Division of Experimental Programs and the Departments of Biological Sciences and Geography and Regional Science

111 Introductory Microbiology (4) Staff

Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Material fee, $20. (Fall and spring)

122 Cell Biology I: Molecular and Subcellular Biology (3) Staff

Structure and function of biological molecules, viruses, and cellular organelles. Prerequisites: one semester of organic chemistry. (Fall)

123 Cell Biology II: Cell Biochemistry (3) Staff

Introduction to the metabolism of generalized cells of animals, plants, and microorganisms, including energetics, enzymes, respiration, biosyntheses, and regulatory mechanisms. Prerequisite: one semester of organic chemistry. (Spring, even years)

124 Cell Biology II: Cell Biochemistry Laboratory (1) Staff

Designed to illustrate some of the principles and techniques of biochemical experimentation. Prerequisite or concurrent registration: BiSc 123. Material fee, $24 (Spring, even years)

127 Genetics (3) Johnson

Introductory course. Basic aspects of transmission of genetic traits with particular reference to the chemical basis of heredity and gene action. (Fall and spring)

128 Genetics Laboratory (1) Johnson

Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $20. (Fall and spring)

129 Cell Biology III: Cell Physiology (3) Staff

Study of cell processes, including growth, division, differentiation, interactions, aging, movements, energy perception and transduction, luminescence. (Spring, odd years)

130 Cell Biology III: Cell Physiology Laboratory (1) Staff

Exercises to illustrate some principles and techniques. Prerequisite or concurrent registration: BiSc 129. Material fee, $24. (Spring, odd years)

138 Advanced Genetics (3) Johnson

Emphasis on the use of genetic analysis in solving modern biological problems. Prerequisite: introductory course in genetics. (Spring)

140 General Ecology (4) Merchant

Lecture (3 hours), laboratory and field (3 hours). Introduction to the concepts of limiting factors, biogeochemical cycles, trophic levels and energy transfer, and their relationship to the structure and function of population, species, communities, and ecosystems. Material fee, $20. (Fall)

144 Aquatic Ecology (4) Merchant

Lecture (3 hours), laboratory and field (3 hours). Principles applied to aquatic systems with special references to physicochemical properties, typical habitats and communities. Laboratory fee, $20. (Spring, odd years)

167 Radiation Biology (3) Schiff
Chemical, physical, and biological aspects of radiation: effects of radiation on cells and organisms, with emphasis on mammals; genetic effects. Recommended: two years of biological sciences, and chemistry or physics. (Fall)

171 Undergraduate Research (arr.) Staff
Admission by permission of the staff member concerned. May be repeated for credit. Prerequisite: Chem 50 or 152; 16 semester hours in Biological Science courses. Material fee, $20 per semester hour. (Fall and spring)

172 Independent Study in Cell and Molecular Biology (2) Staff
Prescribed reading list and consultations with staff adviser culminating in a written report and/or examination. (Fall and spring)

173 Independent Study in Developmental Biology (2) Staff
Prescribed reading list and consultations with staff adviser culminating in a written report and/or examination. (Fall and spring)

174 Independent Study in Organismic Biology (2) Staff
Prescribed reading list and consultations with staff adviser culminating in a written report and/or examination. (Fall and spring)

175 Independent Study in Genetic and Evolutionary Biology (2) Staff
Prescribed reading list and consultations with staff adviser culminating in a written report and/or examination. (Fall and spring)

176 Independent Study in Environmental Biology (2) Staff
Prescribed reading list and consultations with staff adviser culminating in a written report and/or examination. (Fall and spring)

181–82 Senior Seminar (1–1) Staff
Lectures and discussions on current biological problems. (Academic year)

185 Human Nutrition (3) Staff
Dietary requirements and their underlying physiological and biochemical bases; composition of natural and modified foodstuffs and additives; social and economic aspects of nutrition. (Fall)

Third Group

206 Seminar: Radiation Biology (3) Schiff
Actions of radiation at subcellular, cellular, and organismal levels; factors modifying radiation damage; practical considerations in radiation exposure. Prerequisite: BiSc 167 or equivalent. (Spring)

207 Seminar: Origin of Life (3) Staff
Review of experiments and speculations concerning origin of life and molecular aspects of biological evolution. (Spring, odd years)

208 Bioenergetics (3) Merchant
(Formerly Seminar in Bioenergetics)
Study of energy fixation and transfer in ecosystems and of their role in behavior, evolution, population dynamics, and species interactions. Prerequisite: BiSc 140 or equivalent. (Spring, odd years)

209 **Seminar: Principles and Mechanisms of Organic Evolution** (3) — Seifert

Principles and mechanisms of evolution in animals and plants: population phenomena, speciation, and evolution above the species level. (Fall, even years)

220 **Seminar: Cell Physiology** (3) — Shropshire

Review in depth of selected topics. May be repeated for credit. (Fall)

227 **Seminar: Genetics** (3) — Johnson

Current problems in genetics. Students are required to present one seminar covering the full class period. May be repeated for credit. (Fall)

228 **Population Genetics** (3) — Johnson

Consequences of Mendelian inheritance on the population level as exemplified by gene frequencies, random mating, inbreeding, differential fertility and mutation.

229 **Cytogenetics** (3) — Staff

Behavior of chromosomes in mitosis and meiosis as a basis for the transmission of genes from one generation to the next through reproduction and the influence of cytogenetic processes on the mechanisms of evolution.

230 **Understanding Environmental Issues—Water Pollution** (6) — Hufford and Staff

Methods and techniques used in determining water quality; engineering and technological skills currently utilized or available for use in dealing with a variety of water quality aspects; attitudes and approaches of the social scientists, practical aspects of implementing water-quality programs. Preparation of secondary school curricula.

243 **Seminar: Ecology** (3) — Merchant

In-depth study of selected topics, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 140 or equivalent. (Spring, even years)

248 **Analysis of Development** (3) — Mescher

Survey of current research in experimental morphology, developmental genetics, biochemical development, and developmental endocrinology. Prerequisite: BiSc 146 or equivalent. (Spring, even years)

249 **Seminar: Developmental Biology** (3) — Mescher

Discussion and reports on current literature in developmental biology, with emphasis on developmental genetics. Prerequisite: at least one course each in developmental biology and genetics. (Spring, odd years)

250 **Principles and Techniques of Systematics** (3) — Seifert

Examination of the procedures of systematic nomenclature. A study of the methods and rationale used in estimating phenetic and phyletic relationships and in constructing classifications and evolutionary trees. Prerequisite: BiSc 108 or permission of instructor.

255 **Seminar: Consortium Biology** (2)
Topic to be announced in *Schedule of Classes*. (Spring)

295 **Research** (arr.) **Staff**
Investigation of special problems. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BOTANY

Second Group

105 **Local Flora** (4) **Parker**
Lecture (2 hours), laboratory and field (4 hours). Field and laboratory studies on local flora; emphasis on the woody plants. Material fee, $18. (Fall)

106 **Field Botany—Lower Plants** (4) Hufford
Lecture (2 hours), laboratory and field (4 hours). Primarily for non-specialists, emphasizing algae, mosses, and ferns. Material fee, $18.

109 **Developmental Plant Anatomy** (4) Hufford
Demonstration, observation, discussion (6 hours). Initiation and ontogeny of tissues and organs of vascular plants. Material fee, $18. (Spring, odd years)

110 **Comparative Plant Morphology** (4) Hufford
Demonstration, observation, discussion (6 hours). Evolutionary morphology and life histories as a basis for a phylogenetic study and the critical roles plants have in human welfare. Material fee, $18. (Fall, even years)

125 **Flowering Plants** (4) **Parker**
Lecture (2 hours), laboratory and field (4 hours). Origin, evolutionary development, and principles of systematics of flowering plants. Material fee, $18. (Spring)

135 **Plant Physiology** (4) **Weintraub**
Lecture (2 hours), laboratory (4 hours). Physiology of seed plants with emphasis on growth, development, tropisms, and reproduction. Prerequisite: Chem 11 12. Recommended: Chem 50 or 151 52. Material fee, $24. (Fall, odd years)

137 Horticulture (4) — **Parker**

Lecture (2 hours), laboratory (4 hours). Basic principles of growth, propagation, and care of ornamental plants. Material fee, $18. (Fall and spring)

141 Plant Ecology (4) — **Staff**

Lecture (2 hours), laboratory (4 hours). Prerequisite: BiSc 105, 125 and 3 hours of geology. Several Saturday and weekend fieldtrips required. Material fee, $18. (Fall, even years)

149 Freshwater Algae (4) — **Hufford**

Observation and discussion (6 hours). Systematics, morphology, physiology, and water quality interrelationships of freshwater algae. Field experience, including at least one weekend field trip. Material fee, $18. (Fall, odd years)

150 Freshwater Diatoms (4) — **Hufford**

Observation and discussion (6 hours). Taxonomy, morphology, and ecology of freshwater diatoms. Field experience. Material fee, $18. (Spring, even years)

Third Group

221 Seminar: Systematics (3) — **Parker**

Review of current work in various disciplines of systematic research: topics of special interest to participants. May be repeated for credit (Fall, odd years)

237 Seminar: Water Pollution Biology (3) — **Hufford**

Review of current research in water quality and water pollution biology. (Fall, even years)

238 Seminar: Current Topics in Phycology (3) — **Hufford**

(Spring, odd years)

242 Seminar: Plant Ecology (3) — **Staff**

299–300 Thesis Research (3–3) — **Staff**

(Fall and spring)

ZOOLOGY

Second Group

101 Invertebrate Zoology (4) — **Knowlton**

Lecture (2 hours), laboratory (4 hours). General survey of invertebrate animals, including classification, morphology, physiology, embryology, and evolutionary relationships among phyla. Material fee, $20. (Fall)

102 Advanced Invertebrate Zoology (4) — **Knowlton**

Lecture (2 hours), laboratory and field (4 hours). Study of invertebrate systems (cells, tissues, organs, organisms), with emphasis on functional aspects (physiology and ecology) and taxonomy of important groups. Prerequisite: BiSc 101 or equivalent. Material fee, $20. (Spring)

104 Comparative Vertebrate Anatomy (4) Atkins

Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $20. (Fall and spring)

143 Animal Ecology (4) Merchant

Lecture (3 hours), laboratory and field (3 hours). Application of ecological principles to the understanding and manipulation of animal populations. Prerequisite: BiSc 140 or permission of instructor. Laboratory fee, $20. (Spring, even years)

145 Introduction to Vertebrate Embryology (4) Mescher

Lecture (2 hours), laboratory (4 hours). Origin and early development of the individual, formation of organ systems. Emphasis on frog, chick, and pig, with reference to human embryo. Material fee, $20. (Fall)

146 Experimental Developmental Biology (4) Mescher

Lecture (2 hours), laboratory (4 hours). Introduction to the experimental, biochemical, and genetic analysis of developing systems through examination of the literature and laboratory experiments. Prerequisite: BiSc 145 or equivalent, or permission of instructor. Recommended: a course in cell biology or genetics and Chem 50 or 151–52. Laboratory fee, $24. (Spring)

148 Histology (4) Desmond

Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $20. (Fall and spring)

153 Survey of Neurobiology (4) Atkins

Lecture (2 hours), laboratory (3 hours). Study of the gross and cellular anatomy, physiology, and biochemistry of the nervous system; emphasis on mammals. Prerequisite: BiSc 104. Material fee, $24. (Spring, odd years)

154 Vertebrate Zoology (4) Atkins

Lecture and discussion (2 hours), laboratory and field (4 hours). Vertebrate natural history and systematics, emphasizing higher and transitional taxa. Prerequisite: BiSc 104. Material fee, $20. (Spring, even years)

155 Parasitology (4) Kates

Lecture (2 hours), laboratory (4 hours). Introduction to animal parasitology; survey of parasitic types from protozoa through arthropods. Material fee, $20. (Fall, even years)

156 Ichthyology (4) Collette

General biology of fishes, including structure, function, distribution and evolution, with emphasis on adaptations. Prerequisite: background in comparative anatomy and vertebrate zoology, or permission of instructor. (Spring)

157 Comparative Endocrinology (3) Desmond

Comparative study of basic principles of chemical integration, neuroendocrine relationships, and mechanisms of hormone action. Pre-

requisite: BiSc 104, 165 and/or concurrent registration in Chem 151-52 or Chem 50. (Spring)

161 Entomology (4) Seifert

Lecture (2 hours), laboratory (4 hours). The biology of insects, including their morphology, physiology, development, behavior, and ecology. Material fee, $20. (Fall)

162 Insect Population and Evolutionary Biology (4) Seifert

(Formerly Insect Evolution)

Lecture (3 hours), laboratory (3 hours). Study of the interactions of insects with other organisms and the effects these interactions have on insect evolution. Insects as disease vectors, as pollinators, mimetic systems will be discussed. Prerequisite: BiSc 161 or permission of instructor. Material fee, $20. (Spring)

163 Human Physiology (3) Packer

Introduction to the function of organ systems of the human body (Fall)

164 Human Physiology Laboratory (1) Packer

Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Material fee, $24. (Fall)

165 Vertebrate Physiology (4) Packer

Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $24. (Spring)

Third Group

204 Seminar: Invertebrate Zoology (3) Knowlton

Review of selected topics in physiology, development, and ecology of invertebrate animals, including reports on original publications. May be repeated for credit. (Fall)

***205 Comparative Pathology (3)** Zook

An introduction to the study of disease and disease mechanisms in vertebrates, and comparison with disease in man. Recommended: courses in anatomy, histology, and physiology. (Fall)

210 Animal Behavior (3) Staff

Principles of animal behavior, including mechanisms and manifestations from simple reflex systems to social interaction. (Spring, even years)

211 Adaptation and Natural Selection (3) Seifert

(Formerly The Social Insects)

An examination of special evolutionary problems and conflicts as well as peculiar adaptive characters of certain species. These include the evolutionary basis of sociality, sex, maleness and femaleness and the conflict between individual and population survival. Prerequisite: BiSc 108 or permission of instructor.

* Interdepartmental course offered by the Biological Sciences and Pathology Departments.

244 Histophysiology (3) **Desmond**
Study of current publications in the field of histophysiology. (Fall)

252 Seminar: Neurobiology (3) **Atkins**
Study of current publications in comparative neurobiology. (Fall, odd years)

265 Comparative Animal Physiology (3) Packer
Survey of the physiological basis of adaptation of animals to diverse environments, emphasis on nonmammalian vertebrates. Prerequisite: BiSc 165 or equivalent. (Fall)

299–300 Thesis Research (3–3) **Staff**
(Fall and spring)

BUSINESS ADMINISTRATION

Professors R.B. Eastin, E. Timbers, H.R. Page, D.D. Roman, F. Amling, G. Black, P.D. Grub, P.M. Horvitz *(Visiting)*, G.P. Lauter, J. Zwick, N.M. Loeser, A. El-Ansary, W. Keegan, H. Malmgren, B. Burdetsky
Professorial Lecturers L.C. Collins, K.F. McClure, J.P. Murphy, J.F. Doubleday, W.G. Torpey, S. Thurm
Associate Professors R. Eldridge, S.F. Divita *(Chairman)*, S.N. Sherman, C.R. Miller, R.F. Dyer, W.C. Handorf
Associate Professorial Lecturers B. Benefield, J.R. Potter, Jr.
Assistant Professor J.M. Sachlis
Assistant Professorial Lecturers L.R. Brown, S. Tesko, D.P. Lohmann
Instructor C.W. Miller

Programs of study in business administration leading to the degrees of *Bachelor of Business Administration*, *Master of Business Administration*, and *Doctor of Business Administration* are offered by the School of Government and Business Administration (see pages 127–159).

First Group

51 Introduction to Business (3) **Page**
Structure, activities, and problems of business enterprise: its contribution to the individual and to society: careers in business. (Fall and spring)

61 Personal Finance (3) **Staff**
Management of personal and family income and expenses: consumer spending, budgeting, home buying, credit buying, borrowing, banking, saving and investing, insurance and estate planning, taxation.

Second Group

101 The Business Environment (3) Malmgren, Timbers
Economic and legal environment of business enterprise: social and political influences; contemporary problems and issues. (Fall and spring)

102 **Fundamentals of Management** (3) Staff

Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking. (Fall and spring)

104 **Small Business Management** (3) Staff

Essentials of operating a small business: required records and reports, resolution of day-to-day problems, sources of assistance to small businesses. Offered primarily as a service to the business community; open to degree candidates with the approval of the instructor. (Spring)

105 **Personnel Management** (3) Burdetsky

The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities. (Fall and spring)

106 **Leadership in Personnel Management** (3) Staff

A study of the philosophy, principles, policies, and programs for effective personnel management and industrial relations as portrayed by case studies drawn from business and government. Prerequisite: BAd 105 or permission of instructor. (Fall)

107 **Collective Bargaining** (3) Burdetsky

American unionism and collective bargaining: economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 105 or permission of instructor. (Spring)

113 **Real Estate** (3) Amling, Handorf

Principles of urban real estate practice; leasing and property management, valuation, appraisal, financing, taxation, urban growth, urban renewal.

121 **Fundamentals of Insurance and Risk Management** (3) Staff

Function of insurance and risk management in business enterprise.

122 **Insurance and Estate Planning** (3) Staff

Insurance and estate programming in providing protection and estate development; disposition of the individual estate.

131 **Business Finance** (3) Handorf, Miller, Sachlis

Analyzing capital requirements and methods of acquiring funds, planning efficient use of capital. Asset management, financial analysis, sources of funds, capital budgeting, stockholder relationships. Prerequisite: Acct 1, 2; Econ 1; Math 30, 31; Stat 51. (Fall and spring)

132 **International Business Finance** (3) Eldridge

Principles, practices, problems, and institutions of international finance. Emphasis on international financial markets, exchange rates, balance-of-payments restraints, and governmental policies. Prerequisite: BAd 131. (Fall)

133 **Capital Formation** (3) Handorf, Miller

The process of capital formation in a free enterprise economy. Roles of business firms, financial intermediaries, money and capital market institutions, governmental regulatory agencies, fiscal and monetary policies. Prerequisite: BAd 131. (Spring)

138 **Investment and Portfolio Management** (3) Amling

Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security markets. Risk-reward and computer-aided analysis. Prerequisite: Acct 1–2, BAd 131. (Spring)

141 **Basic Marketing Management** (3) Dyer

Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1–2. Laboratory fee, $15. (Fall and spring)

143 **Marketing Research** (3) Dyer

Basic methods and techniques of marketing research, problem definition, data collection, market survey and experimental design, data analysis and presentation. Special topics: attitude research, questionnaire construction and concept testing. Prerequisite: BAd 141. Laboratory fee, $15. (Spring)

144 **International Marketing Management** (3) Lauter, El-Ansary

Analysis of the international marketing position of the United States, channels for international marketing, international advertising media, legal aspects, foreign market surveys, development of policies. (Fall)

145 **Sales Management** (3) Staff

Organization of sales department, sales planning and forecasting, quotas, territories, performance standards, and analysis and control of distribution costs. Prerequisite: BAd 141. (Fall)

147 **Advertising** (3) Dyer

Planning an advertising campaign. Consumer and market information, message appeals, media selection and scheduling, measuring effectiveness. Current criticism and regulation of the advertising function. Other major marketing communication tools, including personal selling and sales promotion, presented. (Spring)

158 **Physical Distribution Management** (3) El-Ansary, Sherman

Logistical considerations of plant, warehouse and store location, inventory control, warehousing and transportation planning. Channels of distribution from an institutional-behavioral viewpoint. Design, management and evaluation of the distribution system. Prerequisite: Econ 1–2. (Fall)

161 **Commercial Law** (3) Collins, McClure, Murphy

Fundamental concepts and principles of law encountered in business activity: contracts, bailments, agency, sales, negotiable instruments, bankruptcy, other topics. Basic legal considerations in business decision-making. (Fall and spring)

171 **Principles of Transportation** (3) Sherman

Impact of intercity transportation systems on society. Emphasis on modal differences in development, economic characteristics, and regulation. Prerequisite: Econ 1–2. (Fall)

172 Public Utilities (3) Staff

Legal and economic meaning of public utility concept; development, services, economic characteristics, rate-making, and regulation with emphasis on electric, gas, and telephone industries. Prerequisite: Econ 1–2. (Fall)

173 Transportation Systems Management (3) Potter

Comparative study, from the standpoint of various carrier modes, of management problems common to all modes of domestic and international transportation. Prerequisite: BAd 171, Econ 1–2. (Spring)

174 Urban Transportation (3) Staff

Problems of developing balanced transportation systems for urban areas—area needs, modal evaluation, cost effectiveness, finance, and marketing. Prerequisite: BAd 171, Econ 1–2; or equivalent. (Spring)

175 Introduction to International Business (3) Grub

Terminology; trade usages and practices; physical movement of goods in international business; conditions essential for successful trading; export shipment, documentation, procedural problems. (Fall)

176 International Business Theory and Policy (3) Eldridge

Theoretical relationships underlying international business transactions, role of government, international agreements between private producers, trade with developing nations, policy. Prerequisite: Econ 1–2. (Spring)

178 International Business Policy and Operations (3) Staff

Analysis of overseas projects according to purpose and type of organization, development and management of overseas operations in different world areas. Prerequisite: BAd 175 or permission of instructor. (Spring)

181 Manufacturing Production (3) Roman

Basic principles and methods of manufacturing production. Manufacturing facilities, plant and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent. (Fall and spring)

192 Internship in Business Administration (3) Staff

Internship assignment with an extramural sponsor: a business firm, a business-related government agency, or an interest group. Open to selected juniors and seniors by permission of adviser. (Fall and spring)

198 Business Policy and Administration (3) El-Ansary, Eastin, Vaill

Terminal undergraduate course in business administration. Integration of functional activities in arriving at overall business policy decisions. Prerequisite: BAd 102, 105, 131, 141, 181. (Fall and spring)

199 Individual Research (arr.)

Assigned topics. Admission by prior permission of adviser. May be repeated once for credit. (Fall and spring)

Third Group

201 **Social Environment of Business** (3) Malmgren, Timbers

Contemporary social forces acting on business management: business responsibility, ethics. (Fall)

202 **Business-Government Relations** (3) Malmgren, Timbers

Regulatory and promotional activities of the government, independent regulatory agencies, antitrust activities, monetary and fiscal policy, regulation of labor-management relations. (Fall and spring)

203 **Legal Environment of Business** (3) Malmgren, Timbers

Business under the U.S. Constitution, federal legislation, legal precedents and agency orders. Major emphasis on court decisions relating to business. Prerequisite: BAd 202 or permission of instructor. (Spring)

204 **Legal Aspects of International and Multinational Business** (3) Staff

Legal environment of international and multinational business including legal systems, antitrust laws, regulation of direct investment, international arbitration and expropriation; topics of current interest. (Fall and spring)

205 **Business Representation and Lobbying** (3)

Strategies, tactics, and techniques used by business in representing itself to the legislative and executive branches and regulatory agencies of the federal government. Legal and practical constraints. Ethical considerations.

208 **Personnel Management and Industrial Relations** (3) Staff

Survey of personnel management practices and procedures, including labor-management relations. (Fall and spring)

209 **Seminar: Personnel Management** (3) Eastin

Industrial personnel and manpower management, research in advanced problems. (Spring)

210 **The Personnel Manager** (3) Staff

The personnel manager and his or her place in the organization, relation to other executives, policy role and relations with chief executive. Problems of the senior personnel executive. Prerequisite: BAd 208 or permission of instructor.

211 **Leadership and Executive Development** (3) Loeser

Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels; executive selection and development. Prerequisite: Mgt 201 or permission of instructor. (Spring)

212 **Unionism and Collective Bargaining** (3) Burdetsky

The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements. (Fall)

213 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3) Burdetsky

Current problems and issues. Prerequisite: BAd 212. (Spring)

220 **Administration of Research and Development** (3) Black, Roman

Examination of technological, political, and economic factors affecting the R&D environment; operational aspects; management problems in military, governmental, and industrial organizations; project selection, resource allocation, personnel, planning and control, measurement and evaluation. (Fall)

222 **International Research and Development** (3) Roman

Technological, political, social, and economic factors affecting international R&D policy; problems in industrial, governmental, and international organizations; world technological forecasting; resource allocation; technology transfer. Prerequisite: BAd 220 or permission of instructor. (Fall)

223–24 **Technology Assessment Theory and Practice** (3–3) Coates

BAd 223: the technology assessment concept. Methods for conducting assessments. Management of assessments. Evaluation of selected assessments. BAd 224: planning and conducting a technology assessment. Prerequisite to BAd 224: BAd 223 or permission of instructor. (Academic year)

225 **Seminar: Manufacturing Production** (3) Staff

Production technology, including new processes, materials, products, equipment, and facilities. Implications of emerging technology in managing the production function. Prerequisite: BAd 181 or permission of instructor. (Spring)

229 **Seminar: Administration of Research and Development** (3) Roman

Individual and/or group in-depth research projects dealing with various phases of research and development management. Topic will vary each time the course is offered according to the emerging technology, current operational problems, and student interest. Prerequisite: six to nine semester hours of research and development management or permission of instructor. (Fall)

231 **Financial Decision-making** (3) Handorf, Sachlis

Functions and objectives of financial management, asset management, problems of internal financial analysis, rate-of-return analysis, financial forecasting, problems of capital demand and supply. Prerequisite: BAd 131. (Fall and spring)

232 **Capital Resource Management** (3) Sachlis

Problems and theory of capital acquisition and allocation. Prerequisite: BAd 231. (Fall and spring)

233 **International Business Finance** (3) Zwick

Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 131 or equivalent. (Fall and spring)

234 **Seminar: Capital Formation** (3) Handorf, Horvitz

Determinants of saving and investment, timing of corporate security issues, analysis of current capital market conditions. Prerequisite: BAd 131 or equivalent. (Fall and spring)

235 **Financial Management** (3) Sachlis, Handorf, Amling

Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 231.

237 **Investment Analysis** (3) Amling

Risk-reward analysis of security investments including analysis of national economy, industry, company, and market; introduction to portfolio management; emphasis on theory and computer methods. Prerequisite: BAd 131. Laboratory fee, $15. (Fall and spring)

238 **Seminar: Investment and Portfolio Management** (3) Sachlis, Amling

Portfolio management theory, application, and computer modeling. Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. Prerequisite: BAd 237. Laboratory fee, $15. (Spring)

241 **Marketing Management** (3) El-Ansary, Dyer, Divita

Marketing management problems; market segmentation, product planning, channels of distribution, advertising, personal selling, sales promotion, pricing and development of integrated marketing programs. (Fall and spring)

243 **Seminar: Marketing Research** (3) Dyer

Research as an aid to decision-making and increased efficiency in marketing, marketing research process, critical appraisal of methods and results, applications. (Spring)

245 **Promotion Management/Marketing Communications** (3) Dyer

Examination of promotion mix from a systems perspective supported by analytical methods and concepts regarding consumer attitudes and behavior. Topics: social context of promotion, role of communication in marketing, behavioral concepts and communications research, message design, economic and financial criteria, development of a promotion program. Prerequisite: BAd 241 or permission of instructor. (Spring)

246 **Buyer Behavior** (3) Dyer

(Formerly Consumer Behavior)

Examination of theory and recent research concerning buyer decision processes. Interdisciplinary behavioral science studies on individual, family, and organizational purchase behavior are treated. Present and potential applications for marketing in the public and private sector are illustrated with cases. Prerequisite: BAd 241 or permission of instructor. (Fall)

247 **Marketing and Public Policy** (3) Divita

Examination of principal areas of public policy formulation affecting marketing practice. Topics: advertising, warranties, product safety, health issues, consumer information systems, informal and formal redress mechanisms, business responsibilities. Government business and advocate viewpoints presented. Prerequisite: BAd 241, 245, or 246; or permission of instructor. (Fall)

248 **International Marketing** (3) El-Ansary, Lauter

Organization for international marketing, demand analysis, product

development and policies, marketing structure and trade channels, advertising and promotion problems and policies, pricing, and legal aspects. Effective international marketing strategy. (Fall and spring)

249 Marketing Strategy (3) Divita

Analysis of complex marketing problems involving policy and operational decisions; emphasis on creative marketing strategy. Prerequisite: BAd 241, 245, and 246; or permission of instructor.

250 Marketing to the Government (3) Divita

Overview of government R&D and systems markets. Government acquisition process, buyer behavior, market research, technological planning and the bid decision, field sales force management, proposals, market strategy, pricing strategy, product-line strategy. (Fall)

253 Distribution Logistics (3) El-Ansary

Problems of physical distribution and supply of goods. Role of logistics in the economy and the business firm, transportation rates and services, location theory and problems, service standards, inventory control, information flow, scheduling, allocation, warehousing, traffic and logistics system organization. (Spring)

255 Multinational Corporations in the World Economy (3) Malmgren, Zwick, Grub

Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strategies, relationships to other nations; national and international controls; future of the multinational corporation. (Fall and spring)

256 Seminar: International Trade (3) Malmgren, Eldridge

Classical and modern concepts of international trade theory, instruments and institutions of trade policy, barriers to trade, preferential treatment and trading blocs, trends and issues. (Fall and spring)

257 Business Policy in the Multinational Firm (3) Grub, Dickie

International market entry and expansion; operating policies, procedures, and problems of multinational companies; developing executives for international business. Prerequisite: advanced master's degree standing. (Fall and spring)

260 Economics for Management (3) Staff

Economic theory and its application in managerial decision-making price theory, income and employment theory, related topics. Review of economic methodology. (Summer)

261 Applied Microeconomics (3) Eldridge

Applications of economic theory and statistics to business decisions involving demand, production, cost, profits, investments, and inventories. Prerequisite: Econ 217, Mgt 203, Stat 111; or equivalent; or permission of instructor. (Fall and spring)

262 Applied Macroeconomics (3) Black

Use of economic theory and statistics in business forecasting; interpretation of economic trends and developments; analysis of governmental economic policies. Prerequisite: Econ 218, Mgt 203.

Stat 111; or equivalent; or permission of instructor. (Fall and spring)

264 Economics of Production (3) **Staff**

Economics of production and manufacturing. Applications to managerial decision-making with respect to production, investment, procurement, research and development, and cost-benefit analysis. Prerequisite: Econ 217, Mgt 203, Stat 111.

275 Seminar: Transportation (3) **Staff**

Problems and special areas of interest in transportation. Prerequisite: BAd 171 or permission of instructor. (Spring)

279 Purchasing and Materials Management (3) Page

Industrial purchasing and materials management principles and practices. Organization and functions in materials management. Determination of requirements, source selection, buying practices, policies, and ethics. (Fall)

280 Procurement and Contracting (3) Sherman

Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. (Fall and spring)

282 Government Contract Administration (3) Sherman

Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes, negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Prerequisite: BAd 280 or permission of instructor.

283 Pricing and Negotiation (3) **Sherman**

Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Prerequisite: BAd 280 or permission of instructor.

284 Procurement Data Management (3) Sherman

Technical data and the procurement process; contract-controlling documentation, patent rights, rights in data, requirements determination and the acquisition of data, federal policies, contractor interests. Configuration management; control of changes. Prerequisite: BAd 280 or permission of instructor.

285 Systems Procurement and Project Management (3) Sherman

Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans and procurement processes. Developing adequate intercontractual business relationships within the environment of public procurement. Management of projects under contract.

290 Special Topics in Business Administration (3) Staff

Experimental offering; new course topics and teaching methods. May be repeated once for credit.

291 **Seminar: Business Management** (3) Eastin
Primarily for doctoral students. Research on various phases of management as practiced in American industry. (Fall and spring)

295 **Research Methods** (3) Staff
Same as Mgt 295 and PAd 295. Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. (Fall and spring)

296 **Business Decision Simulation** (3) Staff
Managerial decision-making in a diversified firm in a simulated competitive environment in which a complex situation is played out using computers. Prerequisite: advanced master's or doctoral degree standing.

297 **Business Policy Formulation** (3) Keegan
Analysis of operational situations and policy issues. Developing and implementing solutions to managerial problems. Prerequisite: advanced master's degree standing. (Fall and spring)

298 **Directed Readings and Research in Business Administration** (3) Staff
Supervised readings in selected fields within business administration. Admission by prior permission of instructor. May be repeated once for credit. (Fall and spring)

299 **Thesis Seminar** (3) Staff
Examination of thesis standards, research philosophy and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff
(Fall and spring)

Fourth Group

Fourth group business administration courses are limited to graduate students and are primarily for doctoral students. They are offered as the demand requires.

302 **Seminar: Government-Business Relations** (3) Malmgren, Timbers
Major current issues affecting government-business relations. Research and discussion on selected issues. Prerequisite: BAd 201, 202, 203; or permission of instructor.

331 **Seminar: Finance and Investments** (3) Handorf, Sachlis, Amling
Research seminar in corporate financial theory, investment portfolio theory and capital market theory. Prerequisite: BAd 232, 234, 238.

341 **Seminar: Marketing** (3) El-Ansary, Dyer
Examination of major theoretical developments in marketing. Topics include advances in research methods, models and data analysis. Emphasis on emerging concepts in consumer behavior, channels, marketing communication and marketing information systems.

358 **Colloquium on International Business** (3) Keegan, Grub
Selected problems in international business with emphasis upon

regionalism, trade barriers, investment incentives, international organization, foreign aid, development assistance and its relation to trade with developing nations, and trade with the Communist bloc. Admission by prior permission of instructor.

359 **Colloquium on Comparative Management** (3) Lauter

Comparative analysis of management systems under different economic, social, and political conditions. Generic characteristics of management and how modified in different environments. Examination of selected literature.

365 **Seminar: Applied Economics** (3) Black

Primarily for doctoral students. Special topics and applications of analytical tools to business decision-making and policy. Prerequisite: BAd 261, 262; or permission of instructor.

381 **Seminar: Materials and Operations Management** (3) Staff

Recent developments in manufacturing production and materials management; impact of technological, economic and social change; significant related trends. Private and public sector policy implications. New and emerging analysis techniques. Prerequisite: BAd 225, 264, 279, 280, or equivalent; or permission of instructor.

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Business Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Lauter

Limited to Doctor of Business Administration candidates. May be repeated for credit.

CHEMISTRY

Professors R.C. Vincent, R.E. Wood *(Chairman)*, T.P. Perros, W.E. Schmidt, D.G. White, J.B. Levy, N. Filipescu
Associate Professors A.D. Britt, E.A. Caress, D.A. Rowley
Assistant Professors M. King, D. Ramaker

Bachelor of Arts or Bachelor of Science with a major in Chemistry (Departmental) –The department offers two undergraduate majors designed to give students broad training in the basic divisions of chemistry: analytical, inorganic, organic, and physical. *Major I* provides considerable concentration in chemistry. However, it permits a wider selection of electives and thus should meet the needs of students preparing to enter medicine, dentistry, or related fields. *Major II* is intended primarily for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified to the American Chemical Society as having met the minimum requirements for professional training. Two foreign languages are recommended for students planning to do graduate work in chemistry.

The following requirements must be fulfilled:

1. Students in either Major I or Major II must meet the general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental adviser regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social studies.)
2. Prerequisite courses for Major I and Major II—Chem 11–12 and 22, or 15-16; Math 30, 31; Phys 1, 2.

3. (a) Required courses for Major I—BiSc 11–12 or Geol 21 22 (required of Bachelor of Science degree candidates only); Chem 111 12, 113–14, 122, 134, 141 151–52, 153–54.

(b) Required courses for Major II—BiSc 11 12 or Geol 21 22 (required of Bachelor of Science degree candidates only); Chem 111 12, 113 14, 122, 141 42 151 52, 153 54, 235; Math 32; one course selected from Chem 195, 207, 213, 221 222, 251; Math 111, 139; Phys 161, 165, 175; Stat 197.

Twelve semester hours in French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish (students in Major II should elect German) are recommended for students in both Major I and Major II.

For graduation with Special Honors in chemistry, application must be made at the beginning of the senior year. Registration in Chem 195 is required at that time.

Master of Science in the field of Chemistry—Prerequisite: a bachelor's degree with a major in chemistry from this University, or an equivalent degree.

Required: the general requirements, pages 89–97. The required 30 semester hours of graduate work must include Chem 213 and 221, and at least two of the following: Chem 207, 236, and 251. The thesis requirement, Chem 299 300, may be in analytical, inorganic, organic, or physical chemistry. Chem 156, or its equivalent, is prerequisite to research work in the field of organic chemistry. A reading knowledge examination in French, German, or Russian (German or Russian preferred) must be passed prior to beginning the third semester of graduate work or before the second half of the work is started, whichever occurs first. A student who intends to become a doctoral candidate is strongly urged to take Chem 207 as early as possible in the master's program.

Master of Science in the field of Geochemistry (an interdepartmental degree offered by the departments of Chemistry and Geology)—Prerequisite: a bachelor's degree with a major in chemistry or in geology from this University, or an equivalent degree.

Required: the general requirements, pages 89–97, including Chem 111–12, Geol 141, 241, 249; Chem 213 or Geol 246; and Chem 299 300. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language approved by the Department of Chemistry or Geology must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Doctor of Philosophy in the field of Chemistry—Required: the general requirements, pages 89–91, 97–99. Chem 207, 213, 221, 235, 251, and 350 are normally required of the doctoral student, in addition to other courses as determined by consultation with the departmental program committee. The tool requirement options are (1) a foreign language reading examination in German and either French or Russian or (2) a foreign language reading examination in German and a demonstrated proficiency in computer programming. The latter option is required for students in physical or theoretical chemistry. Cumulative examinations replace the General Examination requirement.

Research fields: analytical chemistry, inorganic chemistry, organic chemistry, physical chemistry (electrochemistry, kinetics, magnetic resonance, theoretical), physical organic chemistry (reaction mechanisms), and structure and synthesis of natural products.

Doctor of Philosophy in the field of Geochemistry (an interdepartmental degree offered by the departments of Chemistry and Geology)—Required: the general requirements, pages 89–91, 97–99, including a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91; and the satisfactory completion of the General Examinations in four fields, including chemistry and geochemistry.

Bachelor of Arts in Education with a teaching field in Chemistry—Prerequisite: the education curriculum, pages 111–12.
Required: the chemistry option and professional courses on pages 115–16.

Graduate Placement Examinations: All entering students in the master's and doctoral programs in the field of chemistry are required to take the American Chemical Society Graduate Level Placement Examinations, given by the department of chemistry, prior to registration in the Graduate School of Arts and Sciences. The four placement examinations (in the disciplines of analytical, organic, inorganic, and physical chemistry) are of the multiple-choice type. These tests are designed to cover the subject matter in the disciplines generally taught in modern undergraduate programs preparatory for graduate work in chemistry, and the results are used by the department to advise the individual student in planning a program of courses appropriate to the student's background.

Registration: Before completing registration each student must obtain from the representative of the department an assignment to lecture, recitation and laboratory sections. The work of the junior and senior years must be approved by the department.

All graduate students are required to participate in the seminar and colloquium programs.

PHYSICAL SCIENCE

First Group

3–4 **Contemporary Science for Nonscience Majors** (3–3) Filipescu
(Formerly Contemporary Science)
Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological and medical science. Chem 3 is not prerequisite to Chem 4 but both courses must be satisfactorily completed to fulfill the meaningful initiation requirement. Laboratory fee, $20 per semester. (Academic year)

CHEMISTRY

First Group

11–12 **General Chemistry (4–4)** Perros
Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $28 per semester. (Chem 11 and 12—fall and spring)

13 **General Chemistry (4)** Britt
For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry; organic chemistry. Prerequisite: Math 31, Phys 2. Laboratory fee, $28. (Fall)

15–16 **Intensive General and Analytical Chemistry** (Honors Course) (4–4) — Britt

Chem 15: Lecture (3 hours), laboratory (3 hours), recitation (1 hour) Chem 16: Lecture (2 hours), laboratory (6 hours), recitation (1 hour) Equivalent to Chem 11 12 and 22, but with selected topics studied in depth. Prerequisite to Chem 15: high school physics and chemistry Prerequisite to Chem 16: Chem 15. Admission by placement test prior to registration or on basis of College Board Advanced Placement Examination. Laboratory fee, $28 per semester. (Academic year)

22 **Introductory Quantitative Analysis** (4) — Vincent

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28. (Fall and spring)

50 **Introduction to Organic Chemistry** (4) — Caress

Lecture (3 hours), laboratory (3 hours). A terminal course for students in related disciplines. This course does not fulfill the organic chemistry requirement for chemistry majors or premedical students. Prerequisite: Chem 12 or 16. Laboratory fee, $28. (Spring)

Second Group

110 **Introduction to Physical Chemistry** (3) — Wood

Topics include chemical thermodynamics, chemical kinetics, electrochemistry, solution chemistry, membrane and phase equilibria, and others. Prerequisite: Chem 16 or 22, Math 31, Phys 2; or permission of instructor. Not open to chemistry majors. May not be taken for credit by students who have received credit for Chem 111 12 or an equivalent course.

111–12 **Physical Chemistry** (3–3) — Wood, Ramaker

Gas laws, chemical thermodynamics, chemical equilibrium, kinetics, quantum chemistry, atomic and molecular spectra, structure of solids, liquids, and macromolecules. (Academic year)

113 **Physical Chemistry Laboratory** (2) — Schmidt, Wood
(Formerly Physiochemical Measurements)

Laboratory complement to Chem 111. (Fall)

114 **Instrumental Analysis Laboratory** (2) — Schmidt, Ramaker
(Formerly Physiochemical Measurements)

Laboratory complement to Chem 112 and 122. (Spring)

122 **Instrumental Analysis Lectures** (2) — Schmidt

Theory of instrumental methods in qualitative and quantitative analysis, determination of structure, and study of reaction mechanisms with emphasis on electroanalysis, spectrophotometry, and chromatography. Correlated with Chem 114. Prerequisite or concurrent registration: Chem 112. (Spring)

134 **Descriptive Inorganic Chemistry** (2) — Perros

Intermediate-level course emphasizing the descriptive chemistry of the elements. Prerequisite: Chem 16 or 22, 152. Prerequisite or concurrent registration: Chem 111. (Fall)

141–42 Advanced Experimental Chemistry (2–2) White, Caress

Designed to provide the chemistry major with facility in experimental methods common to all disciplines of chemistry. Prerequisite: Chem 154. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $28 a semester. (Academic year)

151–52 Organic Chemistry (3–3) Levy, King

Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 Organic Chemistry Laboratory (1–1) Staff

Laboratory complement of Chem 151-52. Prerequisite or concurrent registration: Chem 151-52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $28 a semester. (Academic year)

156 Qualitative Organic Analysis (3) King

Lecture (1 hour), laboratory (6 hours). Identification of pure organic compounds, separation of mixtures, and identification of their components. Required of all students planning research work in organic chemistry. Prerequisite: Chem 16 or 22, 154. Laboratory fee, $28. (Spring, even years)

191 History of Chemistry (2) Perros

Historical development of chemistry from antiquity to the 20th century. Prerequisite: Chem 12 or 16. (Fall, odd years)

195 Undergraduate Research (1 or 2) Staff

Research on problems approved by the staff. May be repeated once for credit. Laboratory fee, $14 a semester hour. (Fall and spring)

Third Group

207 Chemical Bonding (3) Ramaker

Quantum mechanics, approximate methods, electron spin, Pauli principle, atomic and molecular structure. Prerequisite: Chem 112. (Fall)

211–12 Physical Chemistry (2–1) Wood, Ramaker

Same as Chem 111-12. Admission only by departmental permission. Credit assigned upon satisfactory completion of Chem 213. (Academic year)

213 Chemical Thermodynamics (3) Wood

Application of thermodynamics to chemical problems. Thermochemistry, homogeneous and heterogeneous equilibria, statistical calculation of thermodynamic properties, electrochemistry. Prerequisite: Chem 112 or 212. (Spring)

216 Statistical Mechanics Ramaker

(Formerly Statistical Mechanics as Applied to Chemistry)

Introduction to classical and quantum statistics designed to acquaint students with basic principles and methods. Prerequisite or concurrent registration: Chem 207 or permission of instructor. (Offered on demand)

218 Molecular Spectroscopy (3) — Ramaker

Applications of quantum chemistry, molecular orbital theory, valence bond theory, vibration and rotation of molecules, IR and electronic spectroscopy. Prerequisite: Chem 20. (Spring, even years)

221 Advanced Analytical Chemistry I (3) — Britt

Theory and application of recent spectrometric methods of analysis, including electrical, magnetic, and optical instrumentation. Prerequisite: Chem 122. (Fall)

222 Advanced Analytical Chemistry II (2 or 3) — Schmidt

Lecture (2 hours), laboratory (3 hours--optional). Theory and application of electroanalysis and separations by physiochemical methods. Prerequisite: Chem 122. Laboratory fee, $14. (Spring, even years)

233 Organometallic Chemistry (3) — White

Survey of organometallic compounds with emphasis on the compounds of lithium, boron, aluminum, silicon, the transition metals, and the catalytic role of certain organotransition metal complexes. Prerequisite: Chem 235 and 251, or permission of instructor. (Spring, even years)

235–36 Advanced Inorganic Chemistry (3–3) — Rowley

Application of modern chemical theories to inorganic substances and reactions followed by a detailed study, developed from the periodic table, of the chemistry of the more common elements. Prerequisite to Chem 235: Chem 112, 152. Prerequisite to Chem 236: Chem 235. (Academic year)

251–52 Advanced Organic Chemistry (3–3) — Filipescu

Synthesis, reactions, and properties of organic compounds; fundamental theories of organic chemistry, emphasis on reaction mechanisms. Prerequisite to Chem 251: Chem 112, 152. Prerequisite to Chem 252: Chem 251. (Academic year)

257 Physical-Organic Chemistry (3) — Levy

The transition state theory of chemical kinetics, applications to reaction mechanisms; kinetic isotope effects, linear-free energy relationships, concentrated and "super" acids, Woodward-Hoffman rules, free radical reactions. Prerequisite: Chem 252 or permission of instructor. (Fall, odd years)

258 Synthesis and Structure Determination in Organic Chemistry (3) — Caress

Methods of structure determination and synthesis of complex organic molecules. Prerequisite: Chem 251 or permission of instructor. (Fall, even years)

295 Research (arr.) — Staff

Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit not to exceed a total of 8 semester hours. Laboratory fee, $14 a semester hour. (Fall and spring)

299–300 Thesis Research (3–3) — Staff

Laboratory fee, $28 a semester. (Fall and spring)

Fourth Group

350 **Choice and Design of a Research Problem** (1) Staff
Development in written form of an original research plan, fully referenced, and its oral defense. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy cumulative examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

CHINESE

See **East Asian Languages and Literatures.**

CLASSICS

Associate Professor J.E. Ziolkowski *(Chairman)*
Associate Professorial Lecturer M.E. Norton
Assistant Professor M. Xiroyanni
Assistant Professorial Lecturers D.B. Beers, M. Leibovic, M. Pinkasovic

Bachelor of Arts with a major in Classical Humanities (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses—Clas 1, 2, 3, 4; or equivalent: or Clas 11–12, 13–14; or equivalent: or Clas 15–16, 17–18; or equivalent; or Clas 21–22, 23–24; or equivalent; and Clas 64, 71, 72.
3. Required courses in the major—(a) 12 semester hours selected from second-group classics courses: (b) 18 semester hours selected from Art 101, 102, 103, 111; Hist 105, 108, 109, 110, 111; Phil 111; PSc 117.

Bachelor of Arts with a major in Classical Archeology and Classics (departmental) An interdepartmental major arranged in conjunction with the Department of Art. The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)
2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.
3. Required courses in the major—Art 101, 102, 103, 111; Hist 109, 110; 15 semester hours in second-group courses in Greek or Latin, including Clas 138. (A reading knowledge of French and German is recommended.)

Master of Arts in the field of Classical Archeology, Classics, and History (an interdepartmental degree program offered by the Departments of Art, Classics, and History)—Prerequisite: a bachelor's degree with a background in classical archeology and either Greek or Latin. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 89–97. The program of study consists of 24 semester hours of course work (as many as possible should be

third-group courses) selected in consultation with the appropriate advisor from the departments of art, classics and history; plus a thesis (equivalent to six additional semester hours). Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

LATIN AND GREEK

First Group

1–2 Beginning Latin (3–3) Ziolkowski

Grammatical essentials of the language, appropriate reading selections, development of English derivatives, introduction to Roman life and literature. (Academic year)

3 Intermediate Latin: Prose and Poetry (3) Norton

Development of ability to read and understand Latin literature of moderate difficulty. Prerequisite: Clas 1-2 or equivalent. (Fall)

4 Vergil's Aeneid (3) Norton

Significant passages of Vergil's famous epic—in Latin; reading and discussion of the entire poem in translation. Prerequisite: Clas 3 or permission of instructor. (Spring)

11–12 Beginning Greek: Classical (3–3) Xiroyanni

Study of the grammar, vocabulary, and structure of Greek. Reading of selected classical authors. (Academic year 1977-78 and alternate years)

13–14 Intermediate Greek: Classical (3–3) Xiroyanni

Review of grammar; extensive reading of prose and poetry: e.g. Homer, Herodotus, or a play. (Academic year 1978-79 and alternate years)

15–16 Beginning Greek: Modern (3–3) Xiroyanni

Study of Modern Greek with conversation, composition, and reading of selected passages from contemporary Greek authors. (Academic year 1978-79 and alternate years)

17–18 Intermediate Greek: Modern (3–3) Xiroyanni

Review of grammar, conversation; extensive reading. (Academic year 1977-78 and alternate years)

Second Group

109–10 Major Latin Authors (3–3) Ziolkowski

Selections from one or two major authors will be read each semester. May be repeated for credit. Prerequisite: Clas 3–4 or permission of instructor. (Academic year)

131–32 Latin Prose Composition (1–1) Ziolkowski

Exercises in Latin prose composition for all students who have had at least one year of college Latin.

134 Medieval Latin (3) Andrews

Selections from the Vulgate and representative Latin writers through

the 11th century. Prerequisite: Clas 3, 4; or permission of instructor. May be taken for graduate credit with approval of instructor. (Spring)

139–40 **Major Greek Authors** (3–3) Xiroyanni

Selections from a wide variety of Greek prose, drama, and poetry, suited to the needs of the class. May be repeated for credit with permission of instructor. Prerequisite: Clas 14. (Academic year)

141–42 **Greek Prose Composition** (1–1) Xiroyanni

Exercise in Greek prose composition. Prerequisite: Clas 12 and permission of instructor. (Academic year)

185–86 **Directed Reading** (1, 2, or 3) Staff

Reading of material in the student's field of interest. Admission by permission of instructor.

Third Group

201 **Greek Epigraphy** (3) Xiroyanni

Readings in Greek epigraphical texts. May be repeated for credit with permission of instructor. Prerequisite: at least two years of college Greek. (Fall)

COURSES IN ENGLISH TRANSLATION

First Group

64 **Greek and Latin Origins of English Words** (3) Xiroyanni

Study of Greek and Latin elements in English to improve vocabulary and facilitate understanding of the language of science, philosophy, politics, etc.

71 **Greek Civilization** (3) Xiroyanni

Study of ancient Greek civilization with focus on public and private life as seen primarily through literature. (Fall)

72 **Roman Civilization** (3) Staff

Study of Roman civilization with focus on public and private life as seen primarily through literature. (Spring)

Second Group

105 **Special Topics in Classical Literature** (3) Staff

Focus on a selected topic, such as death in classical antiquity or the hero, or on study of a genre, such as satire or oratory.

108 **Classical Mythology** (3) Norton

Mythology of the Greeks and Romans from the creation of the world: tales of the gods, heroes, and great families that have influenced literature, art, and music. (Fall)

113 **Greek and Roman Drama** (3) Staff

Selected masterpieces of Greek and Roman tragedy and comedy. (Spring)

127 Classical Influence on Western Civilization (3) Ziolkowski

A survey of Greek and Roman influence on Western civilization relevant to modern America: literature, art, law, science, philosophy, etc. (Fall)

138 Seminar: Classical Studies (3) Beers

Survey of the broad range of sources and resources involved in pursuing classical studies: standard references, periodicals, library holdings, papyrology, textual criticism, history of classical scholarship

170 Women in Classical Antiquity (3) Norton

In-depth study and discussion of readings from ancient and modern sources on the role of women in Greek and Roman society.

HEBREW

First Group

21–22 Beginning Hebrew (3–3) Staff

Grammatical essentials of the language; readings selected from classical and modern texts; basic audio-lingual drills for comprehension and expression. Laboratory fee, $17.50 a semester. (Academic year)

23–24 Intermediate Hebrew (3–3) Staff

Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals to liturgical poetry and rabbinic narratives. Laboratory fee, $17.50 a semester. (Academic year)

103 Modern Hebrew Nonfiction (3) Staff

Directed readings in humanities and social sciences. Development of linguistic skills necessary for independent research. (Fall)

104 Modern Hebrew Fiction (3) Staff

Study of selected modern Israeli short stories and poems. (Spring

COLUMBIAN COLLEGE PROGRAM FOR NEW COURSES IN GENERAL AND INTERDISCIPLINARY STUDIES

Committee on Programs: W. M. Reynolds (Chairman)

Two sets of course numbers have been designated to identify new courses sponsored by this program:

701 (General Studies)
721 (Interdisciplinary Studies)

In each case, the course title will be completed by a brief description of the topic of the individual course. Because the courses will be changing constantly, interested students should consult the *Schedule of Classes* for the current semester. The courses will be listed with the other offerings of participating departments.

The 701 number will be used to designate courses taught by individual faculty members. They will explore topics not normally included in departmental offerings, and will utilize insights and methods from disciplines in addition to

those usually identified with the sponsoring department. The 721 number will designate upper-level courses in which faculty from two or more departments investigate a topic of mutual academic interest.

DRAMA

See **Speech and Drama.**

EAST ASIAN LANGUAGES AND LITERATURES

Professor C. Shih *(Chairman)*
Associate Professorial Lecturer T. Lawton
Assistant Professors G.C.Y. Wang, D.L. Lee
Lecturer Z.S. Karasz

Bachelor of Arts with a major in Chinese Language and Literature in the School of Public and International Affairs—See pages 175–80.

Bachelor of Arts with a major in East Asian Studies (China and Japan)—See pages 162–67.

Bachelor of Arts with a major in Chinese Language and Literature in Columbian College of Arts and Sciences (Field-of-Study)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86, including Chin 1-2, 3-4, and 9; or Chin 7-8 and 9; or Chin 5-6 (preferred).
2. The completion of Chin 11-12, 109-10, 163-64, and the passing of the major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199-200) assists the student in preparation for the major examination.

CHINESE

First Group

***1–2 Beginning Mandarin Chinese, Level I** (3–3) Wang

Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $17.50 a semester. (Academic year)

***3–4 Beginning Mandarin Chinese, Level II** (3–3) Wang

Classroom (3 hours), laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $17.50 a semester. (Academic year)

5–6 Beginning Intensive Mandarin Chinese, Levels I-II (8–8) Lee

Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 6: Chin 5. Laboratory fee, $17.50 a semester. (Academic year)

*The combination of Chin 1-2, 3-4, and 9, or the combination of Chin 7-8 and 9, is equivalent to Chin 5-6.

*7–8 **Beginning Intensive Mandarin Chinese** (6–6) Lee

Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 8: Chin 7. Laboratory fee, $17.50 a semester.

*9 **Beginning Mandarin Chinese, Level II** (4) Lee

Reading of simple modern expository writings. Analysis of syntactic structure and practice in writing. Prerequisite: Chin 4 or 8. Laboratory fee, $17.50. (Fall or spring)

10 **Chinese Calligraphy** (1) Staff

Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit.

11–12 **Intermediate Intensive Mandarin Chinese** (6–6) Wang

Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Chin 11: Chin 8 or 9. Prerequisite to Chin 12: Chin 11. Laboratory fee, $17.50 a semester. (Academic year)

13–14 **Reading Chinese for Beginners** (4–4) Staff

Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for graduate students who wish to acquire a reading knowledge without learning to speak or write the language. (Academic year)

†91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

93–94 **East Asian Literature—in Translation** (3–3) Staff

(Formerly Chin 91–92)

Lecture and discussion. Survey of Chinese and Japanese literature from earliest periods through literary masterpieces of the early 20th century.

Second Group

107–8 **Readings in Modern Chinese** (3–3) Staff

Intensive readings in selected modern literary works, social science materials, and documentary materials. Prerequisite: Chin 12 or equivalent. (Academic year)

109–10 **Introduction to Classical Chinese** (3–3) Shih

Introduction to classical writing in Chinese literature, history, and philosophy. Prerequisite: Chin 6 or 9. (Academic year)

123–24 **Introduction to Chinese Linguistics** (3–3) Staff

Introduction to the history of the Chinese language. Analysis of

* The combination of Chin 1-2, 3-4, and 9, or the combination of Chin 7-8 and 9, is equivalent to Chin 5-6.

† An interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, Political Science, and Religion Departments.

linguistic structure of modern spoken Chinese and classical Chinese. Prerequisite: Chin 6 or equivalent, or a course in linguistics.

161–62 **Introduction to Chinese Culture** (3–3) Staff

Survey of the Chinese cultural heritage—literature, philosophy, art, religion, and social history—from pre-history to the modern era. Lecture and discussion in English. (Academic year)

163–64 **Chinese Literature in Translation** (3–3) Karasz

Lectures focusing on major works of poetry, drama, and the novel in their historical and social context. An introductory course. (Academic year)

179–80 **20th Century Chinese Literature** (3–3) Shih

Short stories of Lu Hsün, Lao She, and others. Informal essays by Lu Hsün, Chou Tso-jen, and Chu Tze-ch'ing. Drama of T'ien Han and Ts'ao Yü. Prerequisite: Chin 107 or equivalent.

185–86 **Directed Reading** (3–3) Staff

Reading of material in the student's field of interest. Admission by permission of instructor. (Academic year)

199–200 **Proseminar: Readings for the Major in Chinese Language and Literature** (3–3) Staff

Conferences and group discussions. (Academic year)

Third Group

271–72 **Poetry of the T'ang and Sung Periods** (3–3) Staff

(Formerly Chin 171–72)

Reading of works of leading poets. Discussion of content and style. Prerequisite: Chin 109 or equivalent.

273 **Yüan Drama** (3) Shih

(Formerly Chin 173)

Readings of plays by Kuan Han-ch'ing, Ma Chih-Yüan, Cheng Kuang-tsu, Po P'u, and Wang Shih-fu. Prerequisite: Chin 109 or equivalent.

277–78 **Prose Narratives of the Sung, Ming, and Ch'ing Periods** (3–3) Shih

(Formerly Chin 177–78)

Short stories of the Sung period. Selected readings of Ming-Ch'ing novels. Historical development and stylistic traits. Prerequisite: Chin 107 or equivalent.

JAPANESE

First Group

1–2 **Beginning Japanese, Level I** (4–4) Staff

Lecture (4 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Japn 2: Japn 1. Laboratory fee, $17.50 a semester. (Academic year)

3–4 **Beginning Japanese, Level II** (4–4) Staff

Lecture (4 hours), laboratory (1 hour). Continuation of grammar with more emphasis on written language and reading. Prerequisite to Japn 3: Japn 2. Prerequisite to Japn 4: Japn 3. Laboratory fee, $17.50 a semester. (Academic year)

ECONOMICS

Professors J.W. Kendrick, C.T. Stewart, Jr., J. Aschheim, R.P. Sharkey, H. Solomon, S. Levitan, T. Suranyi-Unger, Jr. *(Research)*, C. Hsieh, J.L. Gastwirth, W.A. Johnson *(Research)*, M.A. Holman *(Chairman)*, R.M. Dunn, Jr.

Adjunct Professors T.F. Carroll, J. Grunwald, J.L. Fisher, P. Swamy

Professorial Lecturers J. Hardt, E.M. Hadley, P.E. Austin, O.C. Snellingen

Associate Professors R.Y. Yin, W.F.E. Long, S.E. Haber, R.S. Goldfarb, J.R. Barth, A.M. Yezer

Associate Professorial Lecturers P.A. Musgrove, S.S. Sutton, M.J. Kohn, S.C. Salop, R.W. Crandall, D.G. Tuerck, G.R. Wilensky, J.E. Fredland

Assistant Professors R. Sines, C.M. Aho, J.J. Cordes, F. Thoumi, S. Neftci, R.C. Sickles

Assistant Professorial Lecturers S.W. Salant, I. Kyriakopoulos

Bachelor of Arts with a major in Economics (Departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Econ 1–2.
3. Required courses in related areas—Math 41 and 42, or equivalent; Stat 111 and 112, or equivalent; six semester hours of a social science other than economics.
4. Required courses in the major—Econ 101, 102, 121, 198, and 15 additional semester hours of second-group economics courses to be approved by the departmental advisor.

Master of Arts in the field of Economics—Prerequisite: a Bachelor of Arts degree with a major in economics from this University, or an equivalent degree. An understanding of basic calculus is assumed for those entering the Master of Arts program in economics.

Required: the general requirements, pages 89–97, including (1) Econ 203–4, 205–6, and 275 or 279; (2) 12 additional semester hours to be selected from other third-group economics courses; (3) a Master's Comprehensive Examination in economic theory; (4) completion of a tool requirement (either the passing of a reading knowledge examination in one foreign language or the satisfactory completion of one of the following courses: Math 124, Stat 97, or Stat 157 58); and (5) either a thesis (Econ 299–300) or 12 semester hours selected from additional third-group economics courses.

Doctor of Philosophy in the field of Economics—Required: the general requirements, pages 89–91, 97–99, including (1) Econ 202, 203–4, 205–6, 215–16, 379 or 380, and 24 additional semester hours of approved graduate course work including Econ 275 or 279; (2) passing of the General Examination in microeconomic theory, macroeconomic theory, and two other fields selected by the student and approved by the doctoral program committee; (3) completion of the

tool requirement (the passing of a reading knowledge examination in one foreign language plus the satisfactory completion of Math 124, Stat 97, or Stat 157–58; and (4) a dissertation to demonstrate the candidate's ability to do original research in one of the following fields: econometrics development, economic history, economic policy, economic theory, environmental economics, history of economic thought, industrial organization, international economics, labor economics, mathematical economics, monetary economics, national income accounting, natural resources economics, public finance, regional and urban economics, and Soviet economics.

Departmental prerequisite: Econ 1 2 is prerequisite to all other courses in economics except Econ 217–18.

First Group

1–2 Principles of Economics (3–3) Hsieh, Long, Dunn

Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics. (Econ 1 and 2—fall and spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Intermediate Microeconomic Theory** (3) Yin, Neftci

Analysis of supply, demand, and pricing. (Fall and spring)

102 **Intermediate Macroeconomic Theory** (3) Kendrick, Yin

Theories of national income determination and growth. (Fall and spring)

104 **History of Economic Thought** (3) Hsieh

History of the major schools of economic thought, influence of changing problems on the development of economic theory. (Spring)

105 **Economic Conditions Analysis and Forecasting** (3) Kendrick

Theory and empirical analyses of economic trends and fluctuations; use of economic indicators and simple econometric models. (Fall)

121 **Money and Banking** (3) Barth

Nature of money, credit, commercial banking, and other financial institutions in the U.S. monetary system. (Fall and spring)

122 **Monetary Theory and Policy** (3) Barth

Analysis of role of money in economic activity in terms of supply of and demand for loanable funds, interest rates and price level. Problems of U.S. monetary policy. Prerequisite: Econ 121. (Spring)

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*Interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, Political Science, and Religion Departments.

*123 **Introduction to Econometrics** (3) Sickles

Construction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Econ 101, 102; Math 31 or 41; Stat 111. (Spring)

130 **Comparative Economic Systems** (3) Aschheim, Yin

Critical exposition of fundamental economic concepts and theories of capitalism, communism, socialism, and fascism.

133 **Economy of the Soviet Union** (3) Hardt

Development and main features of economic life in the Soviet Union. (Fall)

134 **Comparative Communist Economic Systems** (3) Hardt

Analysis of economic development and performance of the Soviet Union and other Soviet-type economies. Institutional aspects and quantitative measures of performance. (Spring)

136 **Natural Resources and Environmental Economics** (3) Yezer

Analysis of market mechanisms for allocating energy and natural resources; cases of market failure in the use of the environment; policies to improve resource allocation using market and regulatory strategies. (Spring)

142 **Labor Economics** (3) Haber

Analysis of labor supply and demand; poverty and income maintenance; relation between wages, prices and unemployment; occupational choice.

†147 **Economic History of Europe** (3) Sharkey

European economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

‡153 **Poverty in America** (3) Boeckmann, Yezer

Exploration of social and economic causes of poverty in the United States and evaluation of present and proposed anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low income groups.

157 **Urban and Regional Economics** (3) Yezer

Analysis of the determinants of urban growth and development; firm location; the functioning of urban land and housing markets.

158 **Industrial Organization** (3) Long

Analysis of the structures and production, pricing, and related practices of industries with emphasis on their significance and on appropriate economic policies. (Spring)

160 **Social and Economic Indicators** (3) Staff

* Interdepartmental course offered by the Economics and Statistics Departments.
† Interdepartmental course offered by the Economics and History Departments.
‡ Interdepartmental course offered by the Economics and Sociology Departments.

161 **Public Finance I** (3) Cordes
Theoretical and institutional analysis of government expenditures, taxation, and intergovernmental fiscal relations. (Fall)

162 **Public Finance II** (3) Cordes
Theoretical and institutional analysis of fiscal policy and debt management. (Spring)

165 **Economics of Human Resources** (3) Stewart, Goldfarb
Economic analysis of education and training, health care, and other contemporary problems. (Fall)

169 **Introduction to the Economy of Communist China** (3) Yin
Background, organization, and operation of the economy. Appraisal of performance and analysis of problems of development. (Fall)

170 **Introduction to the Economy of Japan** (3) Hadley
Analysis of the structure and growth of the Japanese economy. (Spring)

*179–80 **U.S. Economic History** (3–3) Sharkey
Process of economic growth from Colonial times to the present. Development of various sectors in the economy and their interdependence. Econ 179: 1607-1865. Econ 180: 1865 to present. (Academic year)

181–82 **International Economics** (3–3) Dunn, Aho
Econ 181: international trade theory and international monetary theory. Econ 182: continuation of international monetary theory; economic development. (Academic year)

185 **Economic History and Problems of Latin America** (3) Thoumi
Analysis of present structures and problems of Latin American economies. (Spring)

198 **Proseminar in Economics** (3) Aschheim, Holman, Long
Examination of major topics in economic theory and the application of theory and analysis to policy problems. Open only to economics majors in their senior year. (Fall and spring)

199 **Independent Research in Economics** (3) Staff
Under the personal direction of an instructor. Limited to economics majors with demonstrated capacity. Prior approval of instructor required. (Fall and spring)

Third Group

Third-group economics courses (except 217–18) are designed for graduate students in economics or for graduate students with prescribed prerequisites.

202 **History of Economic Thought** (3) Hsieh
Critical analysis and interpretation of the development of economic theory from Plato through the "Keynesian Revolution" and the "Monetarist Counter-revolution." (Fall and spring)

* Interdepartmental course offered by the Economics and History Departments.

203–4 **Microeconomic Theory** (3–3) Goldfarb

Econ 203: demand, production. Prerequisite: Econ 101 or equivalent. Econ 204: market structure, income distribution, intertemporal allocation, welfare economics; other topics. Prerequisite: Econ 203. (Econ 203 and 204—fall and spring)

205 **Macroeconomic Theory I** (3) Hsieh, Barth, Neftci

Theories of income, employment and the price level; aggregate supply and demand; consumption, saving, investment and the multiplier; supply and demand for money; government's and central bank's role in the economy. (Fall and spring)

206 **Macroeconomic Theory II** (3) Hsieh, Barth

Capital and growth theory. Discussion of Cambridge controversy in the theory of capital and one- and two-sector models of economic growth. Other selected advanced topics in macroeconomics. (Fall and spring)

207 **Business Cycle Analysis** (3) Kendrick

Empirical analysis of American business cycles; evaluation of the methodology and findings of the National Bureau of Economic Research. (Spring)

208 **National Income** (3) Kendrick

Theory and measurement of economic aggregates within an integrated national income accounts framework, including balance sheets and wealth statements. (Spring)

210 **Economic Methodology** (3) Stewart

Methodology of economics, review of selected theoretical issues in economic theory. Prerequisite: six semester hours of graduate courses in economic theory. (Spring)

212 **Economics of Property Rights** (3) De Alessi

Application of microeconomic theory to decision-making within business and government organization subject to alternative institutional constraints. Prerequisite: Econ 101. (Spring)

215–16 **Mathematical Economics** (3–3) Sines

Formulation and application of mathematical models in economic theory. Prerequisite: a one-year calculus sequence. Open to undergraduates. (Academic year)

217–18 **Survey of Economics** (3–3) Holman

For graduate students in fields other than economics. Econ 217: price theory. Econ 218: income and employment theory. Departmental prerequisite waived. (Econ 217 and 218—fall and spring)

223–24 **Monetary Theory and Policy** (3–3) Aschheim

Theory of monetary policy within the framework of contemporary American central banking. (Academic year)

233 **Seminar: Agrarian Reform, Income Distribution and Development** (3) Carroll

Equity and income redistribution issues in the context of current developmental programs, stressing land reforms and recent Latin American experience. (Fall)

234 **Seminar: Rural and Regional Development Projects** (3) Carroll
Design and evaluation of rural-based investment projects, with case studies drawn from experience of international agencies, especially in Latin America. (Spring)

235 **Energy Resources and Policy** (3) Johnson
Consideration of economic and related policy issues directed at energy problems. (Fall)

237 **Seminar: Economics of the Environment and Natural Resources** (3) Holman
Analysis of public policy problems relating to the environment and natural resources development and management. (Spring)

241–42 **Labor Economics** (3–3) Goldfarb
Theory of wages and employment, analysis of labor supply and demand. Structural unemployment; occupational choice; labor market discrimination. (Academic year)

243 **Seminar: Manpower Policy** (3) Levitan
Developments leading to expansion of public investment in manpower resources; evaluation of goals and operations of publicly supported programs. Open to undergraduates. (Fall)

244 **Economics of Education** (3) Austin
Returns to investment in education, allocation of resources to and within education, educational financing.

245–46 **Industrial Organization** (3–3) Long, Crandall
Structure and performance of the American economy; emphasis on the economics of antitrust policy and the impact of government regulatory policies. (Academic year)

247 **Seminar: Industrial Organization** (3) Long
Selected topics in regulatory economics and in antitrust economics during alternate years. Topics for 1978: antitrust problems. Prerequisite: Econ 101 or equivalent. (Spring)

248 **Health Economics** (3) Wilensky
Demand for medical care; organization of the health care delivery industry; policy issues on regulation, efficiency and allocation of health care services.

251 **Economic Development Theories** (3) Thoumi
Basic theories of economic growth and development. Emphasis on theories inspired by the underdevelopment process. (Fall and spring)

252 **Economic Development Issues** (3) Thoumi
Topics of current importance in underdeveloped countries, such as income distribution, industrial policies, economic integration, agricultural development and economic planning. Prerequisite: Econ 251. (Spring)

253 **Productivity Analysis** (3) Kendrick
Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels. (Fall)

254 Economics of Advertising and Information (3) Tuerck

Theory and empirical analyses of the role of advertising and information in industry structure and performance. (Fall)

255 Economics of Technological Change (3) Staff

Economic principles related to determining the proper federal role in influencing civilian-oriented technological change. (Fall)

257 Regional Economics (3) Yezer

Analysis of firm location, patterns of interregional or intermetropolitan production, urban and regional growth and patterns of development. (Fall)

258 Urban Economics (3) Yezer

Analysis of spatial relationships among economic activities within an urban area including the urban land, labor, and housing markets; urban transportation models; fiscal relationships among jurisdictions. Prerequisite: Econ 257 or permission of instructor. (Spring)

259 Income Distribution (3) Staff

Theoretical and empirical analysis of income distribution, including analysis of policies related to income inequality. Open to advanced undergraduate economics majors. (Fall)

261 Welfare Economics (3) Stewart

Theories of welfare economics and their applications to public policy; analysis of selected topics in public policy. (Fall)

263 Theory of Public Finance I (3) Cordes

Allocation and distribution aspects of government budget policy, including critical analysis of theories and principles of expenditures, taxation, and intergovernmental fiscal relations. (Fall)

264 Theory of Public Finance II (3) Cordes

Stabilization aspects of government budget policy: analysis of effects of fiscal policy and debt management on level of employment, prices, and rate of economic growth. (Spring)

265 Readings in International Taxation (3) Snellingen

Examination of topics in economic theory and policy of international taxation: taxation of foreign currency and multinational corporations, tax evasion and tax havens, and tax systems for economic development. (Fall)

267 Seminar: Soviet Economy (3) Hardt

Development of the Soviet-type economy. Organization, policies, and problems: monetary, production, allocative, foreign trade, economic growth. Admission by permission of instructor. (Fall)

268 Seminar: Economic Theory and Development in Communist Countries (3) Hardt

Appraisal of the Soviet model for economic development in the communist world, especially in Eastern Europe and China. Admission by permission of instructor. (Spring)

269 Economy of Communist China I (3) Yin

Analysis of organization, operation, policies, and problems. Development of the economy under communism. (Fall)

270 **Economy of Communist China II** (3) Yin
Continuation of Econ 269, examining critical problems of development. Prerequisite: Econ 269 or permission of instructor. (Spring)

271 **Economy of Japan** (3) Hadley
Analysis of Japanese economic institutions and their contribution to Japan's development. (Fall)

*275 **Econometrics I: Introduction** (3) Sickles, Swamy
Single equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equation problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Some exposure to matrix algebra is suggested. (Fall)

*276 **Econometrics II: Simultaneous Equation Models** (3) Sickles, Swamy
Economic models and simultaneous equation systems. Prerequisite: Econ 275. Recommended: a course in matrix theory. (Spring)

*279 **Methods in Economic Statistics** (3) Gastwirth
Application of statistical methods to economics. Curve-fitting, regression, analysis of variance, and chi-square techniques used to analyze economic data. Prerequisite: a one-year course in statistics. (Fall and spring)

281–82 **International Economics** (3–3) Dunn, Aho
Econ 281: theory of international trade and factor movements. Econ 282: international finance. (Academic year)

285–86 **Economic Development of Latin America** (3–3) Grunwald
Econ 285: development models, import substitution, and industrialization; underemployment, inequality, and policies for employment and income redistribution. Econ 286: theory and performance in trade, economic integration, planning for development; foreign aid, foreign investment, technology transfers. (Academic year)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the methodology of his chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

298 **Reading and Research** (3)
Limited to Master's degree candidates. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Fourth-group economics courses are limited to graduate students and are primarily for doctoral candidates. They are offered as the demand requires.

305 **Seminar: Macroeconomics** (3) Staff
Selected topics in macroeconomics. Prerequisite: Econ 205.

* An interdepartmental course offered by the Economics and Statistics Departments.

312 **Seminar: Price Theory** (3) Staff
Discussion of topics of price theory from recent journal articles.

313 **Seminar: Economic Thought** (3) Hsieh
Continuation of Econ 202. Principal trends in economic thought.

315 **Seminar: Topics in Mathematical Economics** (3) Solomon
Intensive study of selected topics, including economic activity analysis, risk and uncertainty, and other topics of current interest. Prerequisite: Econ 215–16.

321 **Seminar: Monetary Theory** (3) Aschheim
Recent developments in monetary theory.

341 **Seminar: Labor Economics** (3) Staff
Current problems in theory and policy.

363 **Seminar: Public Finance** (3) Staff
Selected topics of current interest.

*378 **Seminar: Topics in Econometrics** (3) Swamy
A research seminar covering current econometric literature and special topics. Admission by permission of instructor.

†379–80 **Readings in Economic History** (3–3) Sharkey
Econ 379: American economic history. Econ 380: modern European economic history. Prerequisite: the appropriate second-group preparation and consent of instructor. (Academic year)

390 **Seminar: International Economic Theory** (3) Staff
Limited to graduate students, primarily for doctoral students. Examination of recent contributions in this field.

391 **Seminar: International Economic Policy** (3) Staff
Topics selected from current significant policy problems.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

EDUCATION

Professors C.R. St. Cyr, M.E. Coleman, D. Sinick, R.E. Baker, M.N. Rashid, R. Tillman, A. Marinaccio, L.H. Elliott, L. Nadler, M. Brenner, J.G. Boswell, C.E. Vontress, R.J. Frankie, S. Kavruck *(Visiting)*, M. McIntyre
Professorial Lecturers W.W. Chase, A. Drexler, P.P. Muirhead, A.C. Jensen
Associate Professors D.A. Moore, L. Winkler, D. Linkowski *(Chairman)*, E.P. Kulawiec, G.L. Horrworth, R.I. Peterson, G.D. Wiggs, S.R. Paratore, G.W. Smith, J.W. Fleck, M. Burns, J.C. Heddesheimer

* An interdepartmental course offered by the Economics and Statistics Departments.
† An interdepartmental course offered by the Economics and History Departments.

Associate Professorial Lecturer D. Iwamoto
Assistant Professors C. Reeder *(Research)*, J.A. Greenberg, L.A. Tsantis, G.A. Lofaro *(Research)*
Adjunct Assistant Professor J. Noel
Assistant Professorial Lecturers J.D. Gates, M.R. Phelps, R.E. McNelis, W.N. Davis, B.S. Wine
Instructors S.A.R. Hoth *(Research)*, M. Gazvoda *(Research)*
Lecturers C.S.J. Gage, M.F. Kelso

Programs of study leading to the degrees of *Bachelor of Arts in Education*, *Master of Arts in Education*, *Master of Arts in Teaching*, *Education Specialist*, and *Doctor of Education* are offered by the School of Education (see pages 101–27).

Second Group

Educ 136, 137, 138, 139, 140, 144, and 146 are special methods courses which are to be elected in the senior year by students in the secondary school curriculum after substantial preparation in the teaching fields concerned. Course requirements and hours of credit vary with license requirements. Practices of successful teachers studied; actual teaching content as found in current texts and courses of study reviewed. Prerequisite to all special methods courses: Educ 108, 123, and 131. Additional prerequisites are stated under each course.

100 **Special Workshop in Education** (arr.) Staff
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. **(Fall and spring)**

101 **Career Choices in Education and Allied Services** (3) Horrworth
Introduction to the wide variety of careers available in education and allied services: early childhood through college, museum, rehabilitation, industry, publishing, community, recreation, tourism, and government settings. Supervised three-hour visits to selected sites. **(Fall and spring)**

102 **Introduction to Human Development I** (3) McIntyre
Lectures and three-hour site visits. All aspects of development through the early childhood stage. Field experiences based on wide variety of child study techniques. **(Fall and spring)**

103 **Introduction to Human Development II** (3) McIntyre
Lectures and three-hour fieldwork sessions. Development from middle childhood on. Cultural, familial, and societal influences highlighted. **Prerequisite: Educ 102.** **(Fall and spring)**

104 **Psychology for Learning and Teaching** (3) Horrworth
Principles, theory, nature, and course of learning and teaching processes. Examination and analysis of the strategies and dynamics of teaching and learning in behavioral settings. Three-hour fieldwork sessions. **Prerequisite: Educ 102, 103.** **(Fall and spring)**

105 **Society and the School** (3) **Boswell**
(Formerly Educ 123)
Historical and social development of education, contemporary issues, cooperation of the school with other community agencies, functions of school personnel. **(Fall and spring)**

108 **Human Development, Learning, and Teaching** (3) Horrworth, McIntyre

Lecture and three-hour fieldwork sessions. Principles of effective teaching based on an understanding of human development and the nature of learning. Prerequisite: Psyc 22 and 29 or 112. (Fall and spring)

110 **Elementary School Teaching of Reading** (3) Horrworth

Introduction to methods, techniques, materials, and activities essential to a good elementary school reading program. Prerequisite: Educ 108 and 123, or teaching experience.

111 **Elementary School Curriculum and Methods** (15) Moore and Staff

For seniors. Curriculum and methods of teaching in the elementary school: reading, children's literature, mathematics, science, language arts, social studies, music, art, physical education. Pre-student teaching one and one-half days a week. Prerequisite: Educ 108 and 123. (Fall)

112 **Educational Measurement** (3) Staff

Basic measurement techniques: selection, administration and interpretation of standardized tests; test construction and statistical analysis of test results. (Fall and spring)

113 **Elementary School Art** (3) Staff

Lecture and laboratory (3 hours), field work—as arranged. For undergraduates in the elementary school curriculum. Materials and methods. Material fee, $5. (Spring)

115 **Experimental Course** (arr.) Staff

Courses being offered for the first or second time. Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

118 **Elementary Reading: Classroom Diagnosis and Instruction** (3) Staff

Emphasis on diagnostic procedure aimed at individualizing and improving classroom instruction. Prerequisite: Educ 110 or equivalent. (Fall and spring)

121 **International Experiences** (1 to 6) Staff

Travel to a foreign country for study of a specific topic. (Fall and spring)

124 **Communication Skills and Interpersonal Relationships** (3) Brenner

Theory and practice in the development of professional relationships: teacher-child, teacher-parent, teacher-supervisor, utilizing interview and other activities.

128 **Children's Literature** (3) McIntyre

Lecture (2 hours), field work (2 hours). Newer books for children and the children's classics, contribution of literature to child development. (Spring)

131 **Secondary School Principles and Methods** (3) Boswell, Kulawiec

For seniors. Classroom management and teaching techniques for

initiating, guiding, and evaluating learning activities. Group-work to be arranged. Prerequisite: Educ 108 and 123. (Fall)

132 **Student Teaching in Early Childhood Schools** (6 to 9) McIntyre
For seniors. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent; Educ 150, 152, 153. (Fall and spring)

133 **Supervised Experience in Education** (3 to 6) Staff
Field work, internship, and instructional practice: (1) adult education and human resource development (Wiggs); (2) college student development experience (Burns); (3) higher education (Frankie); (4) museum education (Brenner); (5) counseling (Heddesheimer). Admission by permission of instructor. (Fall and spring)

134 **Student Teaching in Secondary Schools** (6 to 9) Boswell, Kulawiec, and Staff
For seniors. Admission by permission of instructor. Prerequisite: Educ 131. (Fall and spring)

135 **Student Teaching in Elementary Schools** (6 to 9) Horrworth, Moore, and Staff
For seniors. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent. (Fall and spring)

136 **Teaching English in Secondary Schools** (3) McNelis
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in English. (Spring)

137 **Teaching Speech** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in speech or permission of instructor. (Spring)

138 **Teaching Social Studies in Secondary Schools** (3) Boswell
Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of social studies. (Spring)

139 **Teaching Art in Secondary Schools** (3) Staff
Lecture (2 hours), laboratory (2 hours). Prerequisite: 24 semester hours of Art. Material fee, $5. (Spring)

140 **Teaching Mathematics in Secondary Schools** (3) Gates
Lecture (2 hours), field work (2 hours). Prerequisite: mathematics through calculus. (Spring)

144 **Teaching Science in Secondary Schools** (3) Kulawiec
Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of science. (Spring)

146 **Teaching Foreign Languages** (3) Kulawiec
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours of one foreign language. (Spring)

150 **Foundations of Early Childhood Education** (3) McIntyre
Historical developments, philosophy, and objectives of nursery schools, kindergartens, and day care centers: exploration of contemporary programs and models with curriculum implications for schools in the U.S. and abroad. Admission by permission of instructor. (Fall)

152 **Early Childhood Curriculum** (3) McIntyre

Content, approaches, methods, and materials in language arts, mathematics, science, health, social studies, and creative arts. Admission by permission of instructor. (Fall)

153 **Role of the Professional in Early Childhood Education** (3) McIntyre

Planning, reporting, records, teacher-child and teacher-family interaction, diagnosis and evaluation, working with paraprofessionals. Admission by permission of instructor. (Spring)

154 **Community Resources and Materials for the Young Child** (3) McIntyre

Interaction with community agencies for services and resources; physical facilities, including play activities and curriculum materials for the young child. Admission by permission of instructor. (Spring)

161 **Human Development** (3) Rashid

Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

162 **Foundations of Counseling** (3) Heddesheimer, Winkler

Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

163 **Personal and Social Adjustment** (3) Winkler

Mental health problems: emphasis on needs of counselors, teachers and others working with children and adolescents. (Fall and spring)

171–72 **Seminar: International Education** (3–3) Moore

Survey of selected foreign educational systems and cultures. Research, techniques, and materials to develop world-mindedness. Embassy resources utilized.

173 **Comparative Education** (3) Kulawiec

A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study.

Third Group

Departmental prerequisite: A degree from an accredited institution is prerequisite to all third-group courses in education. Adequate professional preparation is prerequisite to all third-group courses in education except for those courses limited to students in the M.A.T. degree program. Undergraduate students in their senior year may enroll in third-group courses with permission from the instructor.

200 **Special Workshop in Education** (arr.)

Topics to be announced in *Schedule of Classes*. May be repeated for credit.

201–2 **International Education** (3–3) Moore

Survey of selected foreign educational systems and cultures. Research, techniques, and materials to develop world-mindedness. Embassy resources utilized.

203–4 **Comparative Education** (3–3) Kulawiec

A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study.

205–6 **The Curriculum** (3–3) St. Cyr

For experienced teachers. Educ 205: curriculum foundations and issues, comparison of curriculum patterns. Educ 206: curriculum development in subject areas, group consideration of student problems. (Academic year)

207 **Curriculum Materials** (3 to 6) St. Cyr

For experienced teachers. Construction of courses of study and classroom teaching aids, with direct application to students' situations.

208 **Human Development** (3) Rashid

Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

209 **Child Development** (3) Rashid

Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood. (Fall)

210 **Adolescent Development** (3) Rashid

Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence. (Spring)

212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3) Paratore, Smith, and Staff

Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data gathering techniques and descriptive statistics.

213–14 **History of Education** (3–3) Boswell

Educ 213: European backgrounds of American education. Educ 214: evolution of the American school system. (Academic year)

215 **Experimental Course** (3) Staff

Courses being offered for the first or second time. Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

217–18 **Philosophy of Education** (3–3) Kulawiec

Educ 217: to help students formulate a personal philosophy of education. Educ 218: social foundations of education—forces that shape policies and offerings of the school. (Academic year)

219 **Elementary School Classroom Procedures** (3) Baker

Current theories of teaching and learning and their application to teaching strategies of elementary school teachers. (Spring)

221 **International Experiences** (1 to 6) Staff

Travel to a foreign country for study of a specific topic. (Fall and spring)

222 **Foundations of Reading Instruction—Early Childhood and Elementary School** (3) Coleman

Historical and psychological background; readiness, special approaches and skills for beginning and elementary readers; evaluation of materials; demonstrations of diagnostic and instructional techniques. (Fall)

223 **Foundations of Reading Instruction—Intermediate and Secondary School** (3) Coleman

Historical and psychological background; determining needs and developing skills for different content; evaluation of materials and demonstrations of teaching techniques. (Fall)

224 **Diagnostic Teaching of Reading** (3) Coleman

Classroom diagnostic and instructional techniques for elementary school level; construction of informal tests; administration and interpretation of informal and standardized tests; study of materials and application of readability formulas. Prerequisite: at least one previous course in reading. (Spring)

226 **Reading in Secondary School** (3) Coleman

Methods, techniques, and materials necessary for testing and developing efficient reading skills, including skills in content subjects; organizing and evaluating reading programs. (Spring)

227 **Basic Issues in Elementary Education** (3) Baker

Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school. (Fall)

228 **Instructional Areas in Elementary Education** (3) Baker

Current trends and research on reading, language arts, social studies, mathematics, science, music, art, and physical education.

229 **Administration of Elementary Education** (3) Carroll

For experienced teachers and administrators. Achieving instructional objectives, organizing and servicing teaching activities, coordinating school and community life. (Summer)

231 **Secondary School Classroom Procedures** (3) Boswell

Current classroom practices: teacher-pupil planning, group procedures, initiatory and culminating activities, individual and group evaluation techniques, teaching aids, etc.; review of recent literature.

233 **Audiovisual Education** (3) Kubalak

Lecture (2 hours), laboratory (1 hour). Selection, evaluation, and use of audiovisual materials; administrative problems in care, operation, maintenance, and use of such materials and equipment. Material fee, $7. (Spring)

234 **Organization for Personalized Learning in the Open Classroom** (3) Staff

Practical application of individualized instruction theories and methods through design, development, implementation, and revision of elementary and secondary level self-instructional packages.

235 **Analysis of Teaching** (3) Boswell

Teaching as work: diagnosing learning skills, program planning and implementation, feedback information on both student and program. (Fall)

236 **Introduction to Education Technology** (3) Wiggs

Consideration of historical perspective, process, instrumentation, and implementation of self-instructional systems.

237 **Systems Approach to Instructional Design** (3) Wiggs

Application of systems techniques to the development of an instructional program.

241 **Education of the Gifted** (3) Staff

For classroom teachers. Nature and discovery of giftedness, provisions for the gifted in regular classes, experimental projects.

242 **The Teacher and School Administration** (3) Staff

(Formerly Educ 271)

Role of federal, state, and local administrative units; school finance; legal controls; school plant; public support; improving teaching conditions. (Fall and spring)

243 **Human Relations in Education** (3) Marinaccio

Principles and practices in human relations between and among learner, teacher, other school personnel, and parents.

245 **School and Community** (3) Marinaccio, Greenberg

The school as an important member of a team of social agencies that builds the community.

246 **Administrative Issues in Urban Education** (3) Staff

Investigation of current issues in urban education. (Fall and spring)

247 **Vocational, Technical, and Occupational Education** (3) Greenberg

(Formerly Adult and Preprofessional Technical and Occupational Education)

Development, current concepts, agencies involved, problems and trends in vocational, technical, and occupational education in the United States.

248 **The Teacher and School Supervision** (3) Tillman

(Formerly Educ 272)

Nature, organization, human relationships, and techniques. (Fall and spring)

249 **Drug Treatment and Resources** (3) Reeder

Individual, social, and cultural factors related to drug abuse. Rehabilitative methods in treating drug abusers; use of community resources. (Spring)

250 **Counseling Drug Abusers** (3) Reeder

Counseling theory and practice applied to drug abusers. Crisis intervention, self-help groups, and family therapy; individual and group counseling. (Fall)

251 **Foundations of Counseling** (3) Heddesheimer, Winkler

Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

252 **Organization and Administration of Counseling Services** (3) Vontress

(Formerly Organization and Administration of Guidance Services)

Principles and procedures for designing and implementing counseling services. Admission by permission of instructor. (Spring)

253 **Individual Appraisal in Counseling** (3) Winkler

Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent. (Fall and spring)

254 **The Middle School** (3) Kulawiec

Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent. (Fall)

255–56 **Secondary Education** (3–3) Kulawiec

Examination of historical, psychological, sociological, and philosophical bases; emphasis on prescriptive implications. Special attention to contemporary problems and practices. (Academic year)

257 **Career Development and Information** (3) Sinick, Vontress

Theories of career development; factors influencing the world of work; procedures for evaluating and using socio-personal, educational, and occupational information. (Fall and spring)

258 **Theories and Techniques of Counseling** (3) Heddesheimer, Vontress

Theories and practices of vocational, educational, and personal counseling. Prerequisite: 12 semester hours in guidance and counseling, including Educ 253 and 257. (Fall and spring)

259 **Administration of the Elementary and Secondary School** (3) Fleck

(Formerly Secondary School Administration)

For experienced teachers and administrators. Survey of administration, including practices of modern schools. (Fall)

260 **Supervision in the Elementary and Secondary School** (3) Fleck

(Formerly Secondary School Supervision)

For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools. (Spring)

261 **Practicum in Counseling and Human Development** (3) Heddesheimer, Rashid, Vontress

(Formerly Practicum in Counseling)

Intensive counseling experience under supervision. Emphasis on rela-

tionship dynamics, analysis, recommendations and follow-up. Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258. (Fall and spring)

262 **Internship in Counseling and Human Development** (3) Heddesheimer, Rashid, Vontress
(Formerly Internship: Counseling)
Counseling experience under University and institutional supervision in a variety of settings. Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 261. (Spring)

263 **Human Resource Development: Training and Education** (3) Wiggs, Nadler
Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development. (Fall)

264 **Design of Training Programs in Human Resource Development** (3) Nadler
Training, education, and development programs for various client systems will be planned using critical events conceptual model. Field work. Prerequisite: Educ 263 and permission of instructor. (Spring)

265 **Futurism and Education** (3) Kulawiec
Contemporary view of the future through readings, discussion, simulation, games, and films. Impact of technology on humans and the environment. Future shock, alternative futures, overchoice. (Summer)

*267 **Interdisciplinary Study of Language Disorders** (3)
For graduate students in education, speech and hearing, and psychology. Psycho-educational team participation, team diagnosis and analysis of case studies. Multidisciplinary understanding of philosophies of learning and treatment of symbolic malfunctioning. (Fall)

268 **Family Counseling** (3) Winkler
The family as a system: how it affects the client and how the client affects it. Didactic presentations, role-playing, and work with simulated families. (Summer)

269–70 **School Business Management** (3–3) Fleck
Educ 269: philosophy, responsibilities, and functions of the business management office in public education institutions. Educ 270: practicum in educational business management. (Academic year)

271 **The Teacher and School Administration** (3)
Role of federal, state, and local administrative units; school finance; legal controls; school plant; public support, improving teaching conditions. (Summer)

273–74 **Teacher Education** (3–3) Boswell
Educ 273: Pre-service teacher education. Educ 274: In-service teacher education. (Academic year)

* An interdisciplinary course offered by the Departments of Education, Psychology, and Speech and Drama.

275 **Seminar: School Finance** (3) Fleck
Educational financial theory, practice, and control, including methods of financing. (Fall)

276 **Seminar: Public Relations in School Administration** (3) Staff
Purposes, gathering materials, disseminating agencies, publicity media, public participation in policy-making. (Spring)

278 **School Law** (3) Fleck
Sources and scope of school law; legal rights and responsibilities of teachers, pupils, and taxpayers. Other legal problems of major interest to the group. (Spring)

279 **Adult Education** (3) Nadler, Wiggs
Current concepts and objectives, historical development, agencies involved, personnel, clients, programs on all levels—community through international. (Fall)

280 **Program Planning in Adult Education** (3) Wiggs
Determining educational needs for adults in school and non-school agencies; planning programs and instruction; budgeting and scheduling of adult programs. Field work with sponsoring agency. Prerequisite: Educ 279 and permission of instructor. (Spring)

283 **Higher Education in the United States** (3) Frankie, Greenberg
History, scope, purpose, present status, programs, and trends in higher education in the United States. (Fall and spring)

284 **Administration of Higher Education** (3) Marinaccio, Greenberg
Government, organization, and administration of colleges and universities; duties of trustees and administrators. (Fall and spring)

285 **Student Activities** (3) Burns
Procedures for working with college students on planning, budgeting, and securing policy approval for innovative campus programming. (Spring)

287–88 **Clinical Study of Reading Problems** (3–3) Coleman, Peterson
For advanced students. Diagnostic and corrective work under supervision in the Reading Center. Prerequisite: Educ 223 and 224 or 226, or equivalent. Material fee, $10 a semester. (Academic year)

289 **Organization and Administration of Reading Programs** (3) Peterson
For principals, assistant principals, supervisors, superintendents and reading teachers. Problems in planning, reorganizing and improving the total reading program. (Fall and spring)

290 **Severe Learning Disabilities in Reading** (3) Peterson
For experienced teachers. Case studies of children and/or adults with severe reading problems, planning and implementing instructional programs. Admission by permission of instructor. Material fee, $10. (Spring)

291 **Planning the School Plant** (3) Chase
Selection of sites; evaluation of existing buildings; utilization of present facilities; adaptation to curricular needs; building, operation, and maintenance problems. (Fall)

293–94 **Research and Independent Study** (3–3) Staff
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

295 **Quantitative Methods II: Research Procedures** (3) Paratore, Smith
Required of all candidates for masters' degrees in education. Analysis of scientific approaches to problems in education: evaluation of research techniques. Prerequisite: Educ 112, 212: or equivalent. (Fall and spring)

297 **Personnel Administration** (3) Fleck
Organization and administration of personnel programs for educational institutions. Basic philosophy, principles responsibilities, and functions.

299–300 **Thesis Research** (3–3) Staff
Required of M.A. in Ed. degree candidates writing master's theses. (Fall and spring)

302 **Quantitative Methods III: Inferential Techniques** (3) Paratore, Smith
Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor. (Fall and spring)

303 **Data Analysis** (3) Linkowski
Use of computer in data analysis. For doctoral students at the dissertation-planning stage. (Fall)

304 **Practicum in Supervision** (3 to 6) Fleck
Practical experience in supervision of instruction. Admission by permission of instructor.

305 **Internship: Supervision** (3 to 6) Fleck
Service in a school situation directed by the University's faculty and school systems; integration of theory and practice.

306 **Quantitative Methods IV: Advanced Research Design** (3) Paratore, Smith
Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent. (Fall and spring)

310 **Museum Studies** (3) Hoth
Study of museums' functions and their educational roles.

311 **Museum Audiences** (3) Brenner
Study of the many audiences of many ages who use and enjoy museums.

312 **Internship in Museum Education** (6) Hoth
Full-time placement in education departments in area museums. Supervision and seminar are provided by George Washington University faculty. Admission by permission of instructor.

316 **Curriculum Developments in Elementary School Social Studies** (3 to 6) Moore

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 **Curriculum Developments in Elementary School Science** (3 to 6) St. Cyr

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 **Curriculum Developments in Elementary School Mathematics** (3 to 6) St. Cyr

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor. (Spring)

321 **Practicum in Curriculum** (3 to 6) St. Cyr

Supervised field experience in curriculum. Admission by permission of instructor. (Fall and spring)

322 **Internship: Reading** (3 to 6) Peterson

Limited to doctoral students in education. Experience in a selected area of college teaching. (Fall and spring)

323 **Internship: Reading** (3 to 6) Peterson

Limited to doctoral students in education. Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

324 **Teaching Reading and Study Skills at the College Level** (3) Staff

Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques; program planning and implementation. Prerequisite: Educ 226 or equivalent, and permission of instructor. (Summer)

325 **Curriculum Theory** (3) St. Cyr

Examination of reviews and research studies in curriculum theory. Focus on trends, values, interpretations, fads, design systems and evaluation. (Fall)

330 **Foundations of Early Childhood Education** (3) McIntyre

Historical developments, philosophy and objectives of nursery schools, kindergartens and day care centers, exploration of contemporary programs and models with curriculum implications for schools in the United States and abroad. (Fall)

332 **Early Childhood Curriculum** (3) McIntyre

Content, approaches, methods, and materials in language arts, mathematics, science, health, social studies, and creative arts. (Fall)

333 **Role of the Professional in Early Childhood Education** (3) McIntyre

Planning, reporting, maintaining records, teacher-child and teacher

family interaction, diagnosis and evaluations, working with paraprofessionals. (Spring)

334 **Community Resources and Materials for the Young Child** (3) McIntyre

Interaction with community agencies for services and resources; physical facilities, including play activities and curriculum materials for the young child. (Spring)

335 **Practicum in Early Childhood Education** (3 to 6) McIntyre

Supervised professional activity in selected early childhood programs; seminar. Prerequisite: 12 semester hours in early childhood education and permission of instructor. (Fall and spring)

336 **Practicum in Reading** (3) Coleman, Peterson, and Staff

Supervised experience in testing and teaching at the Reading Center. Approximately 120 class hours required. Laboratory fee, $10. Admission by permission of instructor. (Fall and spring)

341 **Cognitive Models and Instruction** (3) Rashid

Cognitive models (Guilford, Piaget, etc.) are analyzed as the theoretical basis for planning instructional episodes appropriate at various levels—childhood through adulthood. (Fall)

342 **Language Development** (3) Rashid

Nature of language development; role of language in the socialization process. (Spring)

343 **Advanced Studies in Human Development** (3) Rashid

Review and consideration of empirical research studies on selected topics in human development. Issues, instrumentation and research needs in respect to each topic discussed. Admission by permission of the instructor. (Spring)

353 **Counseling Older Persons** (3) Sinick

Special considerations and counseling emphases on second careers, retirement adjustments, death and dying. (Spring)

354 **Cross-cultural Counseling** (3) Vontress

(Formerly Counseling of Minority Groups)

Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States.

355 **Counseling in Groups** (3) Heddesheimer, Reeder, Winkler

Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling. (Fall)

356 **Guidance and the Disciplines** (3) Staff

For experienced counselors. Exploring the foundations of guidance through the disciplines of psychology, sociology, economics, anthropology, and philosophy.

357 **Personal and Social Adjustment** (3) Winkler

Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

358 **Advanced Theories of Counseling** (3) Vontress, Reeder, Heddesheimer, Linkowski

Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor. (Fall)

361 **Medical Aspects of Rehabilitation Counseling** (3) Sinick

Etiology, symptomatology, and treatment of chronic and traumatic disorders with rehabilitation counseling implications. Admission by permission of instructor. (Fall)

362 **Client Evaluation in Rehabilitation Counseling** (3) Lofaro, Sinick

Test and non-test methods of furthering client and counselor understanding. Prerequisite: Psyc 131. (Spring)

363 **Psychosocial Aspects of Rehabilitation Counseling** (3) Linkowski, Lofaro

Impact of congenital and later disabilities on attitudes, self concepts, and motivations. Implications for rehabilitation counseling. Admission by permission of instructor. (Fall)

365–66 **Field Work in Rehabilitation Counseling** (3–3) Lofaro, Reeder

Field work of one full day a week. Educ 365: concurrent seminar including history, philosophy, and introduction to practice. Educ 366: concurrent seminar including job analysis, placement, and follow-up. Admission by permission of instructor. (Academic year)

367–68 **Internship: Rehabilitation Counseling** (6–6) Lofaro, Reeder

Supervised practice of three full days a week, with seminar providing integration of theory and practice. Prerequisite: Educ 365-66. (Academic year)

369 **Professional Issues in Rehabilitation Counseling** (3) Staff

Culminating seminar covering professional problems and ethical issues. Prerequisite: Educ 367. (Spring)

370 **College Students and Their Community** (3) Burns, Phelps

Survey of literature on the characteristics, behavior, and attitudes of the contemporary college student; college students' interaction with their environment. Admission by permission of instructor. (Fall)

371 **Principles and Practices in College Teaching** (3) Greenberg

General principles, methods, techniques and experimental instructional media for teaching at the college and university level. (Fall)

372 **Internship in College Teaching** (3 to 6) Greenberg

Supervised experience in a selected area of college teaching. Prerequisite: Educ 371. Admission by permission of instructor. (Spring)

379 **The Community-Junior College** (3) Greenberg

The two-year college as it relates to secondary education, four-year colleges, and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges. (Fall)

374 **Current Issues in Higher Education** (3) Elliott, Marinaccio
Prerequisite: Educ 283, 284. (Spring)

375 **Foundations of a College Student Development Program** (3) Burns
College student development as an integral part of higher education programs. (Fall)

376 **College Student Development and Campus Groups** (3) Burns
Principles and procedures of student development programs with campus groups; campus group activities and development of student leadership. (Spring)

377 **Practicum in College Student Development** (3 to 6) Burns
Supervised practical experience in college student development programs. Admission by permission of instructor. (Fall and spring)

378 **Practicum in Teacher Education** (3 to 6) Brenner, Boswell
For selected experienced teachers. Supervised field work relevant to students' professional needs, to be arranged. (Fall and spring)

379 **Practicum in Adult Learning Programs** (3 to 6) Nadler
Supervised practical experience in various forms of adult education and human resource development. Admission by permission of instructor. (Fall and spring)

380 **Sensitivity Training: Laboratory Method** (3) Drexler
A sensitivity learning experience in human relations using unstructured group experience, individual feedback, experimentation, and practice. Admission by permission of department, prior to registration. (Fall and spring)

381 **Adult Learning** (3) Wiggs
Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical and social environment in adult education situations. (Fall and spring)

382 **Instructional Strategies in Adult Learning Programs** (3) Nadler
Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs. (Spring)

383 **Interviewing-Counseling for Human Resource Developers** (3) Wiggs
Applications of interviewing, coaching and counseling skills for the human resource development specialist and others in various occupational settings.

384 **Evaluation of Adult Learning Programs** (3) Wiggs
Measurement and evaluation of adult learning programs in school and nonschool agencies—business, industry, government, voluntary organizations, and community.

385 **Collective Negotiations in Higher Education** (3) Frankie
Theory, practice, problems, and issues in collective negotiations in higher education.

386 **Current Issues in Adult Learning Programs** (3) Wigg
For M.A. in Ed. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission by permission of instructor. (Spring)

387 **Administration of Adult Learning Programs** (3) Staff
Program administration, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations. (Fall)

388 **Case Studies in Higher Education Administration** (3) Marinaccio
Limited to advanced doctoral students in education. Analysis of selected hypothetical cases related to essential administrative functions of colleges and universities. Admission by permission of instructor.

389 **Consultant-Client Relationships in Human Resource Development** (3) Nadler
Examination of the consulting process, consultant-client behaviors and dilemmas using theory and field experience for individual and organizational development. Prerequisite: Educ 264, 280; or approval of instructor. (Fall)

390 **Legal Problems in Higher Education** (3) Frankie
Investigation of legal problems in higher education related to administration, students, faculty, and academic program. (Spring)

391 **College and University Curriculum** (3) Greenberg
Development, patterns, creative design, issues, problems, evaluation and trends in the higher education curriculum. (Spring)

392 **Financing Higher Education** (3) Frankie
Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices. (Fall)

393 **Practicum in Higher Education** (3 to 6) Frankie
Supervised field experiences in higher education; reports and conferences. Admission by permission of instructor. (Fall)

394 **College and University Governance** (3) Marinaccio
Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284. (Fall)

395 **Problems and Practices in Educational Administrative Organization** (3 to 6) Marinaccio
Application of principles and practices concerned with change and evaluation of educational administration.

396 **Internship: Higher Education Administration** (3 to 6) Marinaccio
Service in a higher education situation directed by the University and the cooperating institution to integrate theory and practice. (Fall and spring)

397 **Internship: Elementary Administration** (3 to 6) Brenne
Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

398 **Internship: Secondary Administration** (3 to 6) Fleck

Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

399 **Seminar: Applied Educational Administration** (3 to 6) Fleck

Application of the theories and principles of administration to the public schools. Student participation with guidance by recognized regional practitioners.

Fourth Group

A master's degree from an accredited institution is prerequisite to all fourth-group courses. All fourth-group seminars are open to doctoral candidates or other post-master's degree students with approval of instructor. Study is individually planned on the basis of previous study and experience in the subject field to attain an advanced level of competence and to meet identified professional needs or field requirements.

Each of the following courses is offered fall and spring. Each course may be repeated for credit.

401 **Seminar: History of Education** (arr.) Boswell

403 **Seminar: Philosophy of Education** (arr.) Kulawiec

405 **Seminar: Human Growth and Development** (arr.) Rashid

411 **Seminar: Elementary Education** (arr.) Baker

413 **Seminar: Secondary Education** (arr.) Kulawiec

421 **Seminar: Adult Education** (arr.) Nadler

422 **Seminar: Higher Education Administration** (arr.) Marinaccio

423 **Seminar: Higher Education** (arr.) Marinaccio

424 **Seminar: College Student Development** (arr.) Burns

425 **Seminar: Teacher Education** (arr.) Boswell, Baker

427 **Seminar: Human Resource Development** (arr.) Nadler

429 **Seminar: Educational Personnel Administration** (arr.) Fleck

431 **Seminar: Administration** (arr.) Fleck

433 **Seminar: Supervision** (arr.) Fleck

441 **Seminar: Curriculum** (arr.) St. Cyr

443 **Seminar: Guidance and Counseling** (arr.) Staff

445 **Seminar: Research and Evaluation** (arr.) Paratore, Smith

446 **Seminar: Reading** (arr.) Peterson

490 **Pre-dissertation Seminar** (3) Staff

Required of all Ed.D. degree candidates. Approval of the dissertation prospectus is necessary for successful completion of the seminar. Admission by permission of instructor.

491 **Dissertation Research** (arr.) Staff

Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 490.

EDUCATION POLICY—GRADUATE STUDY

COMMITTEE ON EDUCATION POLICY

C.J. Lange *(Chairman)*, S.K. Bailey, A.D. Kirsch, H.L. LeBlanc, P.H.M. Lengermann, M.N. Rashid, C.T. Stewart, Jr.

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Doctor of Philosophy in the field of education policy. The program is directed by a committee whose members are drawn from the School of Education and from the Departments of Economics, Political Science, Psychology, Sociology, and Statistics.

The scope of the program is policy research and analysis as it relates to education, broadly conceived. It is intended for those who wish to pursue or continue academic careers or careers in policy-making positions.

Required: the general requirements, pages 89–91, 97–99. Candidates must complete four fields of study, one of which must be education policy analysis. Each candidate is to develop a concentration within one academic discipline.

201–2 **Seminar: Current Issues in Education Policy** (3–3) Staff

Review of literature relating to current education policy issues with emphasis on use of research and analysis in formulating and evaluating policy.

222 **Seminar: Topics in Education Policy** (3) Staff

Intensive investigation of special topics in education policy.

290 **Advanced Studies in Education Policy** (3) Staff

Supervised study and field work in selected policy areas.

ENGLISH

Professors C.D. Linton, R.H. Moore, P.H. Highfill, Jr., J.G. Allee, Jr., J.P. Reesing, Jr. *(Chairman)*, E.R. Weismiller, R.N. Ganz, Jr.
Adjunct Professor J.C. Broderick
Associate Professors M.H. McClanahan, A.E. Claeyssens, Jr., R.C. Rutledge, J.A. Quitslund, J.A.A. Plotz, J.H. Maddox
Assistant Professors C.W. Sten, G.R. Bozzini, R.L. Combs, G. Carter, G. Paster, D. McAleavey, J.R. Schneider, O.A. Seavey
Adjunct Assistant Professor C.H. Greer, V.H. Beard, L.S. Pena, R.D. Young, A.M. Zwick, F.C. Reid
Assistant Professorial Lecturers M.F. Green, R.P. Rhinehart, C. Steinberg
Instructor C. Walker
Lecturers B.L.H. Sterman, M.A. Strom, J.M.G. Wuckovich, C.L. MacMullan, M. Morrison, K.A. Baskin, M.V.W. Dow, A.C. Shadell, C.T. Bader, C.G. Beckjord, J. Greene, C. Hartman
Jenny McKean Moore Visiting Lecturer in Creative Writing M. Hacker

Bachelor of Arts with a major in American literature or *English Literature (field-of-study or departmental)*—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social studies and the natural and mathematical sciences.)

2. **Prerequisite courses—Engl 51–52 or 61–62 or 71–72 or 191–92.**

3. Required courses in related areas—(a) as appropriate, 3–12 semester hours, or waiver of level 4, of a foreign language (classical Hebrew, Greek, Latin, French, German, Italian, Russian, or Spanish); (b) six semester hours of philosophy and or religion; (c) six semester hours of history (English, American, European, or world).

4. **Required for the major:**

(a) *Field-of-Study major*—a major examination must be passed in either American or English literature at the end of the senior year. Although no set pattern of courses is prescribed, students are expected to engage themselves with writers and works from the whole chronological span of American literature or English literature. Proseminars in American Literature, Engl 199–200, and in English Literature, Engl 195–96, assist students in their preparation for the major examination. Students who wish to be candidates for graduation with Special Honors in either American or English literature must be in the field-of-study major.

(b) *Departmental major*—30 semester hours of second-group courses offering experience with several approaches to literature which, together, make a discipline of literary study, distributed as follows:

American literature majors—Engl 120; 21 semester hours of American literature courses, including Engl 161–62; six semester hours of English literature courses.

English literature majors—Engl 120, 193–94; three semester hours of American literature; and 18 additional hours of courses offered by the Department of English of which at least 15 hours must be in English literature.

Master of Arts in the field of American literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English, or 24 semester hours in English and or American literature above the sophomore level.

Required: the general requirements, pages 89–97, including (1) 24 semester hours of coursework planned in consultation with the advisor on the basis of the student's undergraduate preparation, including a minimum of six semester hours in English literature; (2) a written Master's Comprehensive Examination; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major portion of the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Master of Arts in the field of English literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English or American literature; or 24 semester hours in English and or American literature above the sophomore level.

Required: the general requirements, pages 89–97, including (1) 24 semester hours of coursework, planned in consultation with the advisor; (2) a written Master's Comprehensive Examination; and (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Doctor of Philosophy in the field of American literature—Required: the general requirements, pages 89–91, 97–99; high-level proficiency in an appropri-

ate foreign language: the passing of a General Examination in four of the six following fields, one of which must be English literature: (1) Early American literature—to 1815, (2) American fiction, (3) American poetry, (4) American Romanticism, (5) American realism, (6) English literature—one of the first seven fields listed below under "Doctor of Philosophy in the field of English literature." Each student plans a program in consultation with a departmental committee.

Doctor of Philosophy in the field of English literature—Required: the general requirements, pages 89–91, 97–99; high-level proficiency in an appropriate foreign language; the passing of a General Examination in four of the eight following fields: 1) beginnings to 1500, linguistics, and history of the language; (2) 1500–1660; (3) 1660–1800; (4) 1800–1900; (5) 1900 to present; (6) drama, including Shakespeare; (7) criticism; (8) American literature—one of the first five fields listed above under "Doctor of Philosophy in the field of American literature." Each student plans a program in consultation with a departmental committee.

Bachelor of Arts in Education with a teaching field in English—Prerequisite: the education curriculum, pages 111–12.

Required: the English option and the professional courses listed on pages 115-16.

Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, reading, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students whose scores or writing skill indicate superior competence will be allowed to waive Engl 10; those whose scores indicate markedly superior competence will be allowed to waive both Engl 10 and Engl 11 or 12.

The admission of international students to any English course is determined by the English Placement Test for Foreign Students. Students should apply to the office of English for International Students to take this test (see page 27).

Departmental prerequisite: Engl 9 or 10 is prerequisite to all other courses in English. A 6-semester-hour course in literature, or equivalent, or written permission of the instructor, is prerequisite for admission to all second-group courses in English except Engl 115, 161–62, and 191–92.

ENGLISH AS A FOREIGN LANGUAGE

First Group

1 English for International Students [0] Bozzini and Staff

Elementary grammar, reading, vocabulary, and conversation. Course meets 10 class hours and five monitored laboratory hours per week. Further laboratory work encouraged. Fees: tuition, $525; laboratory fee, $17.50.

2 English for International Students [0] Bozzini and Staff

Lower intermediate grammar, reading, vocabulary, and conversation. Course meets 10 class hours and three monitored laboratory hours per week. Further laboratory work encouraged. Fees: tuition, $525; laboratory fee, $17.50.

3 **English for International Students** (3) Bozzini and Staff

Intermediate grammar, reading, vocabulary, and conversation. Course meets 10 class hours and three monitored laboratory hours per week. Further laboratory work encouraged. Fees: tuition, $525; laboratory fee, $17.50.

4 **English for International Students** (3) Bozzini and Staff

Higher intermediate grammar, reading, vocabulary review, and conversation; for international students not yet ready for extended training in composition. Course meets 10 class hours and three monitored laboratory hours per week. Further laboratory work encouraged. Fees: tuition charged for five semester hours—$525, plus laboratory fee, $17.50.

5 **English Composition for International Students** (3) Bozzini and Staff

Extended writing practice for international students showing high degree of proficiency in use of English. Development of writing skills; study of expository techniques and library research methods. Course meets four hours per week. Students completing Engl 5 with a grade of *A* or *B* will receive academic credit for the course and may enroll in Engl 11 or 12 to fulfill the Columbian College undergraduate requirement in English. Fees: tuition, $315; special fee, $25.

7 **English Composition for International Students** (3) Bozzini and Staff

A more advanced composition course, following English 5, for undergraduates not yet ready to take Engl 11 or 12 and for graduate students in need of further writing practice. The course requires weekly reading and writing assignments and a research paper. Students are expected to be familiar with expository techniques and library research methods taught in Engl 5. The course meets four hours per week. Fees: tuition, $315; special fee, $25.

ENGLISH COMPOSITION

First Group

9 **English Composition: Language as Communication** (3) Claeyssens and Staff

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semester hours of credit; the reading course meets an additional three hours a week for a maximum of 10 weeks. Fees: tuition, $315; special fee, $25. (Fall and spring)

10 **English Composition: Language as Communication** (3) Claeyssens and Staff

Study and practice of expository techniques; emphasis on the rhe-

torical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and spring)

11 English Composition: Language and the Arts and Sciences (3) Claeyssens and Staff

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12. (Fall and spring)

12 English Composition: Language in Literature (3) Claeyssens and Staff

Study and practice of expository and argumentative techniques through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and diction, and on logical thought, by the study of literary genres, and of the use of language in literature. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11. (Fall and spring)

Second Group

101 Expository Writing (3) McClanahan, Moore

Types of expository writing; weekly exercises based on students' needs; particular attention may be given to problems in the writing of graduate theses. Prerequisite: Engl 9 or 10; 11 or 12. (Fall and spring)

102 Narrative Writing (3) McAleavey

Techniques of narrative writing; class criticism of student writing. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. To apply for the instructor's consent a student should, before registration, submit a writing sample. (Fall)

103 The Writing of Fiction—the Short Story (3) McAleavey

Prerequisite: Engl 102, consent of instructor. To apply for the instructor's consent a student should, before registration, submit a writing sample. (Spring)

105–6 The Writing of Plays (3–3) Claeyssens

Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. To apply for the instructor's consent a student should, before registration, submit a writing sample.

107 The Writing of Fiction—the Novel (3) Claeyssens

Prerequisite: Engl 102 or 103; consent of instructor. To apply for the instructor's consent a student should, before registration, submit a writing sample.

108 Advanced Writing—Poetry and Prose (3) McAleavey

Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. To apply for the instructor's consent a student should, before registration, submit a writing sample. (Fall)

ENGLISH LITERATURE

First Group

51–52 **Introduction to English Literature** (3–3) Quitslund and Staff

Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature. (Academic year)

61–62 **Comedy and Tragedy** (3–3) Staff

Modes of comedy and tragedy as developed in drama, nondramatic verse, and prose fiction in literatures from ancient to modern times. Engl 61: comedy—Chaucer to Borges. Engl 62: tragedy—Book of Job to Beckett. (Academic year)

Second Group

111 **Medieval English Literature—Exclusive of Chaucer** (3) Allee

(Fall)

112 **Chaucer** (3) Allee

(Spring)

115 **Introduction to English Linguistics** (3) Allee

Development of the English language in a historical treatment of English grammar.

116 **Medieval Legend and Saga** (3) Allee

Celtic and Norse.

117–18 **English Poetry: Form and Content** (3–3) Weismiller

Traditional and modern poetry; emphasis on the ordering of language by which poetry brings into being patterns of thought and feeling which release meaning.

120 **Practical Criticism** (3) Plotz

Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

123 **Principles of Literary Criticism** (3) Plotz

Works of major critics; consideration of ways in which literature is analyzed, classified, judged, and justified; Aristotle, Longinus, Dryden, Johnson, Coleridge, Schiller, Arnold, Eliot, Richards, Frye.

125–26 **Elizabethan Verse and Prose** (3–3) Quitslund

127–28 **Shakespeare** (3–3) Highfill

Development of dramatic forms and recurrent themes. Engl 127: histories and comedies. Engl 128: tragedies. (Academic year)

129 **The Earlier 17th Century** (3) Quitslund

Poetry and prose to 1660, exclusive of Milton. (Fall)

130 **Milton** (3) Reesing

131–32 **English Literature, 1660-1780** (3–3) Highfill
Poetry and prose of the Neoclassic period. Engl 131: 1660–1740. Engl 132: 1740–1780.

133–34 **The Romantic Movement** (3–3) Plotz
Engl 133: Blake, Wordsworth, Coleridge. Engl 134: Byron, Shelley, Keats. (Academic year)

135–36 **Victorian Literature** (3–3) Carter
Engl 135: Tennyson, Browning, Arnold; Dickens; Carlyle, Ruskin. Engl 136: George Eliot, Browning, Tennyson, Swinburne, Hardy, Hopkins, Wilde, Pater. (Academic year)

137–38 **The 20th Century** (3–3) Linton
Literature since 1900. Engl 137: poetry and criticism. Engl 138: drama and the novel. (Academic year)

145–46 **Special Topics in English Literature** (3–3) Maddox, Plotz
Engl 145: The novel and the birth of modernism. Engl 146: Literature of World War I—Owen, Sassoon, Ford, Rosenberg, and others. Each course may be repeated for credit. (Academic year)

147–48 **Special Topics in English Literature** (3–3) Quitslund, Paster
Engl 147: Mythology in English Literature—study of works illustrating the various kinds and functions of myths. Engl 148: Modern European drama. Each course may be repeated for credit. (Academic year)

151 **19th Century British Poetry** (3) Staff
Readings in Wordsworth, Keats, Browning, and Swinburne.

153–54 **The English Novel** (3–3) Maddox
Major novelists. Engl 153: 18th century. Engl 154: 19th century. (Academic year)

155–56 **The English Drama** (3–3) Paster
Engl 155: Shakespeare's contemporaries. Engl 156: Historical survey, 1660 to present.

157 **20th Century Drama** (3)
Representative continental, English, and American plays of the 20th century.

158 **20th Century British Prose Fiction (3)**

191–92 **Introduction to European Literature** (3–3) Plotz and Staff
Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid*; dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann. Open to freshmen and sophomores. May be taken to satisfy the requirement for meaningful initiation into the humanities. (Academic year)

193–94 **History of English Literature** (3–3) Reesing
(Academic year)

195–96 **Proseminar in English Literature** (3–3) Quitslund
For field-of-study majors in English literature. Themes and concerns

basic to the English literary tradition, which draw connections between diverse works from the Old English period to recent times. (Academic year)

197 **Independent Study** (3) Reesing and Staff
Open to honors candidates in the field-of-study major during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in English literature. (Fall and spring)

Third Group

212 **Studies in Chaucer** (3) Allee

213 **Old English** (3) Allee
Old English grammar and readings.

214 **Beowulf** (3) Allee
Prerequisite: Engl 213 or equivalent.

217 **English Poetry: the Formal Development** (3) Weismiller

218 **Form and Content in Modern Poetry** (3) Weismiller

219 **Research Methods and Bibliographical Materials** (3) Broderick
Principal bibliographical sources and typical problems in research. (Fall)

223–24 **Studies in Literary Criticism** (3–3) Plotz

225–26 **Studies in 16th Century English Literature** (3–3) Quitslund
(Engl 226—spring)

227–28 **Studies in Shakespeare and His Contemporaries** (3–3) Paster
(Engl 228—spring)

229 **Studies in English Literature, 1600-1660** (3) Reesing
Chief figures exclusive of Milton.

230 **Studies in Milton** (3) Reesing

231–32 **Studies in English Literature, 1660–1780** (3–3) Highfill
(Academic year)

233–34 **Studies in the Romantic Movement** (3–3) Plotz
(Engl 233—fall)

235–36 **Studies in Victorian Literature** (3–3) Carter

237–38 **Studies in 20th Century Literature** (3–3) Linton

253–54 **Seminar: the English Novel** (3–3) Maddox
(Engl 254—spring)

255–56 **Studies in Dramatic and Theatrical History** (3–3) Highfill
Engl 256: Seminar in drama and theater of the Restoration and 18th

century, held among the Folger Library collections. A Folger Institute Seminar.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 309. Students wishing to register for these courses should consult the chairman of the English Department.

301–308 **Folger Institute Seminars** (3 each) Staff
Topics will be announced.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

First Group

71–72 **Introduction to American Literature** (3–3) McClanahan and Staff
Historical survey. Engl 71: From beginnings to the Civil War. Engl 72: From the Civil War to present. (Academic year)

Second Group

120 **Practical Criticism** (3) Plotn
Uses of language and complex shapes of thought in literature: introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

161–62 **Studies in American Literature** (3–3) Seavey, Sten
Same as AmCv 161–62. Major factors in the national cultural tradition as shown by outstanding writers. (Academic year)

163–64 **Major American Poets** (3–3) Ganz
Advanced critical study of significant writers and movements. Engl 163: From beginnings through the 19th century. Engl 164: The 20th century. (Engl 163—fall)

165–66 **American Drama** (3–3) Combs, Claeyssens
Historical and critical study of significant plays and forms. Engl 165: From beginnings to 1930. Engl 166: Since 1930. (Academic year)

167–68 **The American Novel** (3–3) Sten, Maddox
Historical and critical study of significant novels. Engl 167: From beginnings through the 19th century. Engl 168: The 20th century. (Academic year)

170 **The American Short Story** (3) Sten
Historical development of the American short story. (Fall)

171–72 **Major American Writers** (3–3) Staff

173–74 **Selected Literary Movements** (3–3) McAleavey, Schneider
Engl 173: Pound and his predecessors- Browning, Ruskin, Pater, Wilde, and others. Engl 174: Images of the South—Southern character, manners, and traditions as portrayed by Jefferson, Simms, Stowe, B. T. Washington, Faulkner, Wright, and others. Each course may be repeated for credit. (Academic year)

175–76 **Special Topics in American Literature** (3–3) Claeyssens, McAleavey
Engl 175: Biography as literature. Engl 176: Fictions *per se*—a study of fabulist prose fiction, focusing on storytelling, fabrication, and make-believe; readings from Poe, Kafka, Borges, Coover, Wildman, Pynchon, Katz, Barthelme, Marquez, Cortazar. Each course may be repeated for credit. (Academic year)

181–82 **TBA** TBA
Two special courses offered each year by the Jenny McKean Moore Visiting Lecturer in Creative Writing. Each course may be repeated for credit. (Academic year)

197 **Independent Study** (3) Reesing and Staff
Open to honors candidates in the field-of-study major during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in American literature. (Fall and spring)

199–200 **Proseminar in American Literature** (3–3) Sten
For field-of-study majors in American literature. Readings, conferences, and group discussions. (Academic year)

Third Group

219 **Research Methods and Bibliographical Materials** (3) Broderick
Principal bibliographical sources and typical problems in research. (Fall)

263–64 **Studies in American Poetry** (3–3) Ganz, McAleavey
(Academic year)

267–68 **Seminar: American Fiction** (3–3) Maddox
Research and critical reading: fiction and the criticism of fiction. (Engl 267—fall)

281–82 **Seminar: Early American Literature** (3–3) Seavey
(Academic year)

283–84 **Studies in American Romanticism** (3–3) Broderick
Engl 283: Melville—the early fiction. Engl 284: Emerson, Thoreau, and the Concord Group: the intellectual background and the literary achievement. (Engl 283—spring)

285–86 **Seminar: American Literature, 1865-1900** (3–3) Schneider
Realism in America.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ENVIRONMENTAL STUDIES

COMMITTEE ON ENVIRONMENTAL STUDIES

H. Merchant *(Chairman)*, O. Bergmann, S.W. Burks, R.S. French, I.I. Glick, R.W. Kenny, R.C. Lindholm, W.E. Schmidt

Columbian College of Arts and Sciences offers interdepartmental programs in environmental studies leading to the degree of Bachelor of Arts or Bachelor of Science. The program leading to the degree of Bachelor of Arts is designed for the student whose orientation is essentially political or social and who expects to enter law, politics, urban planning or other areas for the purpose of altering society's responses to environmental problems. The program leading to the degree of Bachelor of Science is designed for the student with well-developed interests in science who seeks professional identification as a field or laboratory worker in the environmental sciences.

Bachelor of Arts with a major in Environmental Studies (Departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):

(a) Mathematics and/or Statistics—nine semester hours selected from Math 31, 32, 51, 52, 111; Stat 91, 97, 110, 118, 198.

(b) Natural Sciences—six to eight semester hours selected from BiSc 11–12; Chem 11–12; Geol 1–2; or Phys 1, 2.

(c) Social Studies—12 semester hours selected from Anth 1–2; Econ 1–2; Geog 51, 52; PSc 4 or 5, 6; Psyc 1, 5–6; or Soc 1, 2.

3. Required courses in the major (48 semester hours):

(a) BiSc 140 (four semester hours).

(b) eight semester hours selected from BiSc 101, 102, 103, 108, 109, 110, 111, 115, 118, 123, 124, 125, 127, 135, 141, 143, 144, 145, 146, 149, 150, 161, 167, 185, 208, 210, 211, 237, 242; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 125, 128, 141, 147, 163, 181, 272; Phys 6, 14, 15, 16, 27–28.

(c) 30 semester hours in courses selected from two departments in the following—Anth 151, 152, 170, 186, 263, 267; Econ 101, 102, 136, 157, 158, 161, 199, 237; Geog 127, 132, 135, 140, 142, 144; PSc 103, 104, 108, 125, 146, 151, 155, 196; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.

(d) Envr 151–52 (six semester hours).

Bachelor of Science with a major in Environmental Studies (Departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.

2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):

(a) Mathematics and/or Statistics—nine semester hours selected from Math 31, 32, 51, 52, 111; Stat 91, 97, 110, 118, 198.

(b) Natural Sciences—12 to 16 semester hours selected from BiSc 11–12; Chem 11 12; Geol 21 22; Phys 1, 2. Either BiSc 11 12 or Chem 11 12 must be selected.

(c) Social Studies—12 semester hours selected from Anth 1–2; Econ 1–2; Geog 51, 52; PSc 4 or 5, 6; Psyc 1, 5–6; Soc 1, 2.

3. Required courses for the major (48 semester hours):

(a) BiSc 140 (four semester hours).

(b) 20 semester hours selected from BiSc 101, 102, 103, 108, 109, 110, 111, 115, 118, 123, 124, 125, 127, 135, 141, 143, 144, 145, 146, 149, 150, 161, 167, 185, 208, 210, 211, 237, 242; Chem 22, 50, 122, 151 52, 153 54; Geol 5, 125, 128, 141, 147, 163, 181, 272; Phys 6, 14, 15, 16, 27–28.

(c) 18 semester hours selected from Anth 151, 152, 170, 186, 263, 267; Econ 101, 102, 136, 157, 158, 161, 199, 237; Geog 127, 132, 135, 140, 142, 144; PSc 103, 104, 108, 125, 146, 151, 155, 196; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.

(d) Envr 151–52 (six semester hours).

The science and social studies courses listed under 3(b) and 3(c) above must be taken in not more than three departments.

In choosing elective courses for both the Bachelor of Arts and Bachelor of Science degree programs, students are reminded that permission of the Dean of Columbian College of Arts and Sciences and the Committee on Environmental Studies is necessary to take courses not offered by Columbian College of Arts and Sciences, and that a maximum of 12 semester hours of such courses may be taken. The following may be of interest to the environmental studies major: BAd 101, 171, 172, 173, 174, 201, 203; *CE 194, 197; HKLS 152; U&RP 153, 201, 205. The permission of the instructor, the department chairman, and the Dean of the School of Government and Business Administration is necessary to take graduate courses (numbered 201 and above) in that School.

151–52 **Senior Seminar in Environmental Studies** (3–3) Staff

Limited to majors in environmental studies. Directed reading and discussion of contemporary environmental problems.

*See the School of Engineering and Applied Science Bulletin for civil engineering courses.

EXPERIMENTAL HUMANITIES*

Professor C.C. Mondale
Associate Professor R.S. French *(Director)*
Assistant Professor M. Kernan *(Visiting)*
Lecturer G.H. Williams

EXPERIMENTAL HUMANITIES

First Group

4 Politics and Values (3) — Staff

A freshman course; limited enrollment. Students will be housed in Thurston Hall. Field-study and case-study of value conflicts implicit in selected political issues involving federal policy and legislation. Concurrent registration in a special section of PSc 3 required. Students registering for Hum 4 in the fall semester will be required to register for Hum 6 in the spring semester. Admission by permission of instructor. (Fall)

6 Politics and Values (3)
(Formerly Contemporary Political Imagination)

Continuation of Hum 4. Concurrent registration in a special section of PSc 2 required. Prerequisite: Hum 4. (Spring)

†**26 Environmental Issues** (3) — French, Langran, Schiff

An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy. (Spring)

37 Computers and Society (3) — Ireland

Introduction to history and nature of the computers, to their contemporary uses and to ethical and social issues related to their development (e.g., artificial intelligence; dangers to privacy and freedom). Instruction in elementary programming. (Spring)

40 Washington, D.C.: Culture and Politics (3) — French and Interdisciplinary Team

An all-university course designed primarily for freshmen and transfer students. Major facets of metropolitan life, past and present, analyzed by faculty, students, and community leaders. (Fall)

51–52 Individuality and Community (3–3) — Mondale, Poppen

Examination of contemporary patterns of coming-of-age and of community, and of value issues involved in electing among them. Team-taught by a humanist and a social scientist. First semester based in the classroom in preparation for second semester based in the field. Admission by permission of instructor. (Academic year)

72 Language of Cinema (3) — Kernan

Introduction to cinema as language through analysis of the compo-

* Administered by the Division of Experimental Programs.
† Offered jointly by the Division of Experimental Programs and the Departments of Biological Sciences and Geography and Regional Science.

nents of film structure—camera, editing, sound, movement, music, dialogue and mise-en-scène. Class work includes reading, visual communication exercises and a final project. Admission by permission of instructor. (Spring)

91–92 **The Creative Process** (3–3) Claeyssens and Interdisciplinary Team
The process of invention in the arts. Professors of drama, dance, film, art and English participate. Examination of documents in which artists in all fields discuss work in process. Exchange with practicing artists through visits to rehearsal and studios and through discussion with visiting artists and critics. (Academic year)

Second Group

101–2 **Supervised Field-Study** (6–6) French
Community-based projects supervised by appropriate faculty. Juniors and seniors admitted by permission of instructor. Prerequisite to Hum 102: Hum 101. (Hum 101 and 102—fall and spring)

171–72 **The Legal Process** (3–3) Nash,* Williams
The function which law plays in society and the nature of the legal process. Examination of the societal assumptions and values that mold the law. Emphasis upon institutions that make up the law—the courts, administrative agencies, legislative bodies, and executive agencies. Open only to juniors and seniors by permission of instructor. (Academic year)

174 **Science and Values** (1 or 3) Schmidt, Parke
Study of the effects of scientific knowledge and technology on social institutions and the image of man, of the question of ethic and morality in science, and of the science of values. Admission by permission of instructor. (Spring)

SERVICE-LEARNING EXPERIMENTAL HUMANITIES

See **Service-Learning Program.**

FORENSIC SCIENCES

Professors T.P. Perros, A.H. Desmond, J.E. Starrs, T.F. Courtless, Jr., C. O'Rear *(Chairman)*
Professorial Lecturer D.A. Crown
Adjunct Professor C.G. McWright
Associate Professor E.S. Sirulnik *(Visiting)*
Associate Professorial Lecturers R. Brunelle, D.D. Garner, J.T. Smith, R. Golten, J.T. Wieseman, G.M. Saiger
Assistant Professors N.T. Lappas, W.F. Rowe
Assistant Professorial Lecturers K.E. Melson, J.D. Kogan, R.S. Bennett, D.I. Labowitz, C. Smiley

* Ralph Clarke Nash, Jr. is Professor of Law in the University's National Law Center.

Master of Forensic Sciences—Prerequisite: a bachelor's or a graduate degree from an accredited institution of higher learning and academic or professional experience in the behavioral, biological or physical sciences, law, medicine or law enforcement.

Required: the general requirements, pages 89–97. For students not electing a thesis, 36 semester hours of coursework are required; for students electing a thesis, 30 semester hours of coursework, plus a thesis (equivalent to six semester hours), are required. ForS 220 is required of all students; ForS 224 is required of students who do not have a LL.B. or J.D. degree. The following are also required: (1) at least nine hours in the forensic physical sciences selected from ForS 201, 202, 203, and 204; (2) at least six hours in forensic medicine selected from ForS 214, 260, 261, and 269; (3) at least six hours in law and the administration of justice from ForS 225, 227, 228, and 251; (4) the remaining semester hours must be selected in consultation with the advisor so that each program of study includes at least 21 hours selected from the forensic physical sciences, forensic medicine, the physical and natural sciences (including basic medical sciences), and research or a thesis. Other coursework may be selected from the behavioral sciences, law, management science, or forensic sciences. It is strongly recommended that students participate in the internship program. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

Master of Science in Forensic Science—Prerequisite: a bachelor's or graduate degree in the biological or physical sciences from an accredited college or university.

Required: the general requirements, pages 89–97. The program of study consists of 30 semester hours of coursework, plus a thesis (equivalent to six semester hours). Individualized programs of study will be developed to meet the career objectives of each student. Each such program of study must include ForS 251. All candidates must also participate in the departmental seminar each semester. The remaining semester hours must be selected from approved courses in the forensic sciences, biological and physical sciences, management science, law, or basic medical sciences. It is strongly recommended that students participate in the internship program. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

Master of Arts in Special Studies—Prerequisite: a bachelor's or graduate degree from an accredited college or university.

Required: the general requirements, pages 89–97. The program of study consists of 36 semester hours of approved coursework drawing upon the forensic sciences, law, criminology, management science, sociology, and psychology. ForS 220, 224, 225, 228, 254, 265, 266, Soc 258, 261, 263, PAd 223, and Mgt 201 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

The interdisciplinary programs leading to the degrees of Master of Forensic Sciences and Master of Science in Forensic Science may include course work from the School of Government and Business Administration, from the National Law Center, from the School of Medicine and Health Sciences, and graduate coursework in the behavioral, biological and physical science departments of the University. Students work closely with their advisors in setting up a program that meets their interests, needs, and background knowledge. The Department of Forensic Sciences is affiliated with the Armed Forces Institute of Pathology in a program of mutual exchange among students, courses, and facilities. For further information, contact the Department of Forensic Sciences.

201 **Forensic Serology** (3) Garner, Lappas

Fundamental analysis of blood and other biological materials. Specific

procedures and techniques used in forensic serology—from presumptive tests to blood enzyme classifications. Laboratory exercises.

202 **Instrumental Analysis** (3) Perros, Rowe

Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophometric techniques and mass spectrometry. Laboratory exercises.

203 **Examination of Questioned Documents** (3) Crown, Brunelle

Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory exercises.

204 **Firearms and Tool-mark Identification** (3) Brunelle, Rowe

Methods for identifying firearms, cartridge casings, tool-marks, tire marks, and footprints. Laboratory exercises.

214 **Forensic Psychiatry** (3) Saiger, Smith

Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

220 **Introduction to Forensic Science** (3) Lappas, O'Rear, Rowe

(Formerly The Crime Lab, the Forensic Scientist, and the Criminal Lawyer)

Survey of the forensic physical sciences; qualifications and preparation of expert witnesses and their court roles in criminal and civil cases; operation and functioning of the forensic laboratory.

224 **Introduction to Criminal Law** (3) Starrs, Golten, Bennett, Wieseman

(Formerly Introduction to Criminal Law, Procedure, Evidence, and Legal Methods)

Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.

225 **Advanced Criminal Evidence** (3) Kogan, Labowitz

Procedural rules affecting the collection and use of physical evidence. Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224. (Spring)

227 **Advanced Criminal Procedure** (3) Staff

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Prerequisite: ForS 224.

228 **Administration of Criminal Justice** (3) Staff

Consideration and analysis of selected advanced problems in the administration of criminal justice. Emphasis on the role and professional responsibilities of prosecutor and defense counsel and on developmental trends in the law. Prerequisite: ForS 224.

250 **Multidisciplinary Aspects of Forensic Science** (3) Staff

Scientific and legal aspects of current concepts. Includes qualification as an expert witness, chain of custody, impact of testimony on the jury, admissibility of evidence, class evidence vs. individualized evidence, and search and seizure.

251 **Moot Court** (3) Kogan

Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes, etc.

254 **Selected Topics in the Forensic Sciences** (3) Staff

Current issues in research, investigation, and law.

260 **Introduction to Forensic Medicine** (3) Thompson

Anatomy and physiology of the human body with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart relating to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 **Introduction to Forensic Pathology** (3) Thompson

Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 **The Illicit Use of Drugs** (3) Lappas, O'Rear

Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. in Sp.Std degree candidates; open to others with permission of instructor.

266 **Seminar: Modern Trends in Criminal Justice** (3) O'Rear

Recent advances in criminal justice. Discussions incorporate several disciplines including science, law, management, social sciences, and psychology.

268 **Photography in the Forensic Sciences** (3) Staff

Basic use of forensic photography, including selection and use of equipment, photographs as evidence, close-up work, and common misconceptions. Laboratory fee, $25.

269 **Forensic Toxicology** (3) O'Rear, Lappas

Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology.

270 **Medicinal Chemistry** (3) O'Rear

Theory and principles of classification, synthesis, and structure activity relationships of drugs. Discussion of the complex chemical events that take place between administration of a drug and its action on the user, with emphasis on drugs of abuse.

271 **Advanced Forensic Serology** (3) Garner, Lappas

Advanced techniques in forensic serology and enzymology. Emphasis

on practical laboratory examinations and classifications of dried blood stains. Among systems presented are ABO and subgroups, MN, rhesus, phosphoglocumutase erythrocyte acid phosphatase, and adenylate kinase isoenzymes. Laboratory fee, $25. Prerequisite: ForS 201, or permission of instructor.

272 **Advanced Forensic Toxicology** (3) Lappas

Lectures, student seminars, laboratory demonstrations, and exercises dealing with advanced laboratory techniques and other topics of current interest in forensic toxicology. Prerequisite: ForS 269 or permission of instructor. Laboratory fee, $25.

273 **Forensic Chemistry** (3) Rowe

Advanced course in the recognition, collection, preservation, and analysis of trace evidence. Includes soils, paint, hairs, fibers, and arson accelerants. Laboratory exercises include classical chemical techniques, as well as more advanced instrumental methods of analysis. Prerequisite: ForS 202 or permission of instructor. Laboratory fee, $25.

274 **Forensic Laboratory Management** (3) O'Rear

Theories of management with emphasis on laboratory leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the forensic laboratory as an organization and as a system within a larger organization.

295 **Research** (arr.) Staff

Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member. Laboratory exercises in those methods in principal use in crime laboratories.

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

FRENCH

See **Romance Languages and Literatures.**

GENETICS—GRADUATE STUDY

Committee on Genetics

S.O. Schiff *(Chairman)*, D. Brusick, R. Crystal, R.F. De Giovanni-Donnelly, G.S. Edwards, R.C. Gallo, D. Gillespie, C.B. Jacobson, P.D. Kind, K. Krell, W.M. Leach, C.R. Merril, W. Merrick, W.G. Nash, S. O'Brien, J.C. Petricciani, J. Schlom, K. Todaro

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of genetics. This program is directed by a committee whose members are drawn from the Departments of Biochemistry, Biological Sciences, Child Health and Development, Microbiology, Obstetrics and Gynecology, and Pharmacology; and from four government agencies—the Bureau of Radiological

Health, the National Institutes of Health, the National Institute of Mental Health, and the Food and Drug Administration.

A baccalaureate degree is required for admission to the degree program. The undergraduate program must have included the following: eight semester hours each in biology, inorganic chemistry, and organic chemistry; six semester hours in physics; and six semester hours in English composition and literature. While not required for admission, courses in embryology, genetics, and mathematics are strongly recommended.

Master of Science in the field of genetics.—Required: the general requirements, pages 89–97. The 30 semester hours required in this program must include Gnet 201–2 and Gnet 299–300. The remaining 20 semester hours of coursework are to be selected, with the approval of the Committee on Genetics, from the departmental courses listed below. The tool requirement may be met by satisfactorily completing an approved course in biostatistics or by passing a foreign language reading examination.

Doctor of Philosophy in the field of genetics.—Required: the general requirements, pages 89–91, 97–99. The program of study must include Gnet 301–2, eight to 10 semester hours of biochemistry, six to eight semester hours of cell biology, 10 to 12 semester hours of genetics, and two or three semester hours of statistics. These courses may be selected from the departmental listings below. The tool requirement may be met by the satisfactory completion of an approved course in biostatistics and the passing of a foreign language reading examination, preferably in French or German.

GENETICS

Third Group

201–2 **Advanced Problems in Genetics** (2–2) Staff

Gnet 201: lecture, seminar. Gnet 202: individual study with each member of the Committee on Genetics. Required of all master's degree candidates in the field of Genetics. (Academic year)

295 **Research** (arr.) Staff

Open to qualified master's degree students. Research on problems approved by the Committee on Genetics. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Academic year)

Fourth Group

301–2 **Advanced Problems in Genetics** (2–2) Staff

Gnet 301: lecture, seminar. Gnet 302: individual study with each member of the Committee on Genetics. Required of all students preparing for the Doctor of Philosophy general examination whose field of study is genetics. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANATOMY

203 *Human Embryology* (1)
256 *Human Genetics* (1)
258 *Cytology* (3)
260 *Electron Microscopy in Cellular Biology—Lecture* (1)
261 *Electron Microscopy in Cellular Biology—Laboratory* (2)

BIOCHEMISTY

221–22 *General Biochemistry* (4–5)
224 *Biochemistry of Enzymes* (1)
227 *Biochemistry Seminar* (1)
232 *Proteins and Amino Acids I* (1)
233 *Proteins and Amino Acids II* (1)
241 *Isotopes* (3)
266 *Biochemical Genetics and Inherited Metabolic Diseases* (2)

BIOLOGICAL SCIENCES

Biology

108 *Organic Evolution* (3)
111 *Introductory Microbiology* (4)
122 *Cell Biology I: Molecular and Subcellular Biology* (3)
123 *Cell Biology II: Cell Biochemistry* (3)
124 *Cell Biology II: Cell Biochemistry Laboratory* (1)
127 *Genetics* (3)
128 *Genetics Laboratory* (1)
129 *Cell Biology III: Cell Physiology* (3)
130 *Cell Biology III: Cell Physiology Laboratory* (1)
138 *Advanced Genetics* (3)
167 *Radiation Biology* (3)
206 *Seminar: Radiation Biology* (3)
220 *Seminar: Cell Physiology* (3)
222 *Seminar: Topics in Molecular Biology* (3)
227 *Seminar: Genetics* (3)
228 *Population Genetics* (3)
229 *Cytogenetics* (3)
248 *Analysis of Development* (3)
249 *Seminar: Developmental Biology* (3)

Zoology

145 *Introduction to Vertebrate Embryology* (4)
146 *Experimental Developmental Biology* (4)

MICROBIOLOGY

211 *Microbiology* (4)
214 *Tissue Cell Culture and Somatic Variation* (4)
229 *Immunology* (3)
230 *Immunology Laboratory* (2)
231 *Immunobiology* (1)
233 *Biology of Viruses* (2)
234 *Biology of Viruses—Laboratory* (2)
258 *Microbial Genetics* (2)
260 *Cellular Immunology* (1)

OBSTETRICS AND GYNECOLOGY*

391 *Cytogenetics* (1)
392 *Reproductive Genetics* (1)
395 *Gametogenesis* (1)
399 *Medical Genetics* (1)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology* (2)
256 *Molecular Pharmacology* (2 or 3)
258 *Cancer Chemotherapy* (1)

STATISTICS

91 *Principles of Statistical Methods* (3)
117 *Analysis of Variance* (3)
127 *Statistics for the Biological Sciences* (3)
153–54 *Mathematical Models in Population Genetics* (3–3)

GEOGRAPHY AND REGIONAL SCIENCE

Professors M. Gordon *(Chairman)*, F. Belaunde-Terry *(Visiting)*
Professorial Lecturers J.W. Nystrom, J. Baclawski, J. Pickard, S. Baum
Associate Professors J.C. Lowe, E.O. Pederson
Associate Professorial Lecturer P. True
Lecturer S.E.S. Mastran
Assistant Professorial Lecturer D.E. Starsinic

***Bachelor of Arts with a major in Geography (Departmental)*—The following requirements must be fulfilled:**

1. The general requirements as stated on pages 73–74, 80–86.
2. Required courses in the major—30 semester hours of second-group geography and regional science courses, including Geog 105, to be chosen in consultation with the undergraduate advisor.

* See the *School of Medicine and Health Sciences Bulletin*.

Master of Arts in the field of Geography—Prerequisite: a Bachelor of Arts degree with a major in geography from this University, or an equivalent degree.

Required: the general requirements, pages 89–97. The minimum requirement consists of 30 semester hours of approved course work including a thesis; with the approval of the department, a student may elect a program of study without a thesis. A Master's Comprehensive Examination in three fields is required. Candidates must fulfill the tool requirement in one of three ways: (1) passing a reading knowledge examination in an approved foreign language; (2) satisfactorily completing six semester hours in statistics selected from Stat 105, 117, 118, 155, 187, 188; or (3) satisfactorily completing Stat 113 and 198 (computer programming).

Bachelor of Arts in Education with a teaching field in Geography—Prerequisite: the education curriculum, pages 111–12.

Required: the geography option and the professional courses listed on pages 115–16.

Master of Arts in Education with a field in elementary or secondary education (specializing in geography)—Prerequisite: a bachelor's degree with sufficient concentration in geography to permit successful pursuit of graduate study in the Department of Geography and Regional Science. Candidates must be accepted by both the School of Education and the Department of Geography and Regional Science.

Required: the general requirements, pages 119–21, including 15 semester hours of graduate courses in geography and regional science.

First Group

*26 **Environmental Issues** (3) Staff

An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy. (Spring)

51 **Introduction to Geography** (3) Staff

General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts. (Fall, spring and summer)

52 **Introduction to Economic Geography** (3) Pederson

Examination of the basic principles which determine the location of economic activities. (Spring)

†91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia. (Fall)

Second Group

104 **Special Techniques in Cartography** (3) Staff

Descriptive and statistical techniques for thematic mapping; computer cartography. Laboratory fee, $18. (Spring)

* Offered jointly by the Division of Experimental Programs and the Biological Sciences and Geography and Regional Science Departments.
† An interdepartmental course offered by the Geography and Regional Science, East Asian Languages and Literatures, Economics, History, Philosophy, Political Science, and Religion Departments.

105 **Scope and Methods of Geography** (3) Pederson
Nature of geographical inquiry, approaches to the study of geography, empirical research methods. Admission by permission of instructor.

106 **Introduction to Remote Sensing** (3) Staff
Examination of the principles and applications of remote sensing techniques using aerial photography and satellite imagery. Laboratory fee, $18. (Fall)

125 **Transportation Geography** (3) Lowe
Consideration of the spatial aspects of interaction, diffusion, and information transfer, including nodal activity and hierarchies, network geometry, gravity models, and diffusion processes. (Spring)

126 **Economic Geography** (3) Lowe
Theories concerning the location of economic activities. Exercises in locational analysis. (Fall)

127 **Population and Settlement** (3) Starsinic
Patterns of world population; factors contributing to population pressures, growth, and migrations. (Spring)

132 **Resource Management and Conservation** (3) Staff
Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies. (Fall)

134 **Geography of Water Resources** (3) Staff
Analysis of the spatial pattern of water resources in the United States; problems associated with current and future requirements; political decision-making processes and problems of governmental organization and intergovernmental arrangements.

135 **Resources and Environmental Quality** (3) Staff
Analysis of the spatial pattern of resources; emphasis on the problems of international river basin and ocean resource management. (Spring)

139 **Geographic Perspectives on Current World Problems** (3) Nystrom
Consideration of the impact of contemporary changes in national resources and populations on political communities. (Fall)

140 **Urban Geography** (3) Pederson
Analysis of the internal spatial structure of cities; emphasis on explaining patterns of location within the city. (Fall and summer)

141 **Urban Settlement** (3) Pederson
Distribution of urbanization on the surface of the earth; processes which lead to urbanization; theories which can be used to analyze the location of cities. (Spring)

142 **Urban Environments** (3) Lowe
Consideration of the climatic, hydrological, and other selected aspects of the physical geography of the city as well as of the nature, organization, and spatial patterns of urban delivery systems.

143 **Social Geography** (3) Lowe
Consideration of behavioral aspects of geography incorporating spatial cognition, spatial behavior, social space, migration processes, and conflicts in spatial decision-making. (Fall)

144 **Environmental Adaptation** (3) Lowe
Relationship between people and their environment; emphasis on bioclimatological responses, disease ecology, nutritional demands, land capabilities, artificial environments, and environmental perception. (Summer)

145 **Cultural Geography** (3) Staff
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations. (Spring)

146 **Political Geography** (3) Pederson, Gordon
Analysis of the interrelationships between the political community and the human and physical environment. (Fall)

153 **Geography of Europe** (3) Gordon
Cultural and physical regional patterns of both Western and Eastern Europe. (Summer)

161 **Latin America** (3) Gordon
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America. (Spring)

164 **Geography of China** (3) Staff
Survey of the cultural and physical regional patterns of China.

189–90 **Readings in Geography** (arr.) Staff
(Academic year)

198 **Current Geographic Topics** (3) Staff
A consideration of geographic aspects of topical and future problems of society. Topics change each year. Topic for fall: regional development. Topic for spring: food and population. May be repeated for credit. (Fall and spring)

Third Group

*215 **Field Methods in Cultural Ecology: Settlement Patterns in Pre-Columbian Mesoamerica** (3 or 6) Humphrey, Langran
Field and laboratory examination of settlement patterns and sociological structures in pre-Columbian Mesoamerica and their relationships to agricultural water-control systems. (Summer)

221 **Seminar: Cultural Geography** (3) Staff
Study of the noneconomic processes which affect the location of human activity. Topics to be discussed are environmental perception and evaluation, social definitions of space, and diffusion of innovations.

* An interdepartmental course offered by the Geography and Regional Science and Anthropology Departments.

222 **Seminar: Resources and the Environment** (3) Staff
Analysis of the spatial variations and interrelationships of resources and the environment.

223 **Seminar: The Population-Food Balance** (3) Gordon
Analysis of spatial problems associated with the dynamics and interaction of population growth and agricultural output. (Fall)

224 **Seminar: Political Geography** (3) Pederson
Examination of the political factor in location theory and analysis of the nature of political territories. (Fall)

225 **Seminar: Transportation Geography** (3) Lowe
Analysis of human spatial interaction: emphasis on networks, graph theory, gravity, interaction and potential models, migration models and diffusion processes. (Spring)

243 **Seminar: Urban Geography** (3) Lowe
Functional processes affecting the evolving morphology and internal spatial patterns of urban phenomena; emphasis on economic factors, behavioral considerations, and impact of time. (Fall)

244 **Seminar: Urban Systems** (3) Pederson
Examination of central place theory and other theories of urban location.

261 **Seminar: Geography of Latin America** (3) Gordon
Selected topics related to population, environment, and land use in Latin America.

265 **Seminar: Geography of the Soviet Union** (3) Baclawski
Physical features, economic geography, natural and energy resources, industries, transportation, agriculture, population trends; emphasis on population patterns along borderlands, especially the Sino-Soviet border. (Spring)

266 **Seminar: Geography of China** (3) True
Perspectives of environmental constraints to agricultural growth, adequacy of energy and mineral resources, types of developmental models; regional, physical, and cultural patterns and significance to contemporary problems and policies. (Fall)

*280 **Principles of Demography** (3) Staff
Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

*281 **Methods of Demographic Analysis** (3) Staff
Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the

* An interdepartmental course offered by the Departments of Geography and Regional Science and Statistics.

methodology of his or her chosen discipline; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

295 Research (arr.) **Staff**

May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3) **Staff**

(Fall and spring)

GEOLOGY

Professors G. Teleki, G.V. Carroll, F.R. Siegel *(Chairman)*, A.G. Coates
Emeriti Professors J.W. Pierce, E.G. Kauffman, I.G. Sohn
Professorial Lecturers N. Hotton, D. Appleman, I. Zietz
Associate Professors R.C. Lindholm, J.F. Lewis
Associate Professorial Lecturers W.E. Maloney, M.A. Buzas, J.E. Hazel, A. Geiger, M.D. Turner
Assistant Professorial Lecturers F.J. Collier, T.L. Hughes, E.T. Miller

Bachelor of Arts or Bachelor of Science with a major in Geology (Departmental)—**The following requirements must be fulfilled:**

1. **The general requireemnts as stated on pages 73–74, 80–86.**
2. **Required introductory course—Geol 21–22.**
3. Required courses in related areas (a) Chem 11 12; (b) Math 30 (for the degree of Bachelor of Arts) or Math 30 and 31 (for the degree of Bachelor of Science); (c) Stat 91; and (d) BiSc 11, *and* Phys 1 or 3 (for the degree of Bachelor of Science).
4. Required courses in the major—Geol 111, 112, 117, 118, 122, 123, 151 52 for the degree of Bachelor of Arts and Bachelor of Science; Geol 128, 166, 189, for the Bachelor of Science degree only.

Bachelor of Science with a major in Geology—Engineering option (Engineering Geology) (Departmental)—An interdisciplinary curriculum offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science. (Students wishing to work toward the degree of Bachelor of Science [Civil Engineering] with geology option [geotechnical engineering] should consult the *School of Engineering and Applied Science Bulletin.)* The following requirements must be satisfied:

1. The general requirements as stated on pages 73–74, 80–86.
2. Required introductory courses—ApSc 57, 58; Chem 13; EE 51; Geol 21 22; Math 30, 31; **Phys 1, 2.**
3. Required courses in the major: CE 120, 140, 166, 167, 168, 182, 185; Geol 112, 117, 118, 122, 136, 189, 195, and one course chosen from Geol 128, 141, 164; Math 111, 112; ME 126 or 131, Stat 91 or 102 or ApSc 115.

Master of Science in the field of Geology—Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University, **or an equivalent degree.**

Required: the general requirements, pages 89–97. Master of Science degree candidates must include in their program of study Geol 141, 163, 205, and 272. Geol 299–300 *Thesis Research* is required for both degrees. Candidates must pass a Master's Comprehensive Examination before submitting their thesis topic. A reading knowledge examination in French, German or Russian must be passed before beginning the thesis work or before beginning the third semester of graduate work; other languages may be taken with permission of the

department. With the permission of the department, candidates in the Master of Science program may substitute another approved tool subject in lieu of one foreign language requirement.

Master of Science in the field of Geochemistry (an interdepartmental degree offered by the Departments of Geology and Chemistry)—Prerequisite: a Bachelor's degree with a major in geology or in chemistry from this University or an equivalent degree.

Required: the general requirements, pages 89–97, including Chem 111–2, Geol 141, 241, 249, Chem 213, and Geol 299–300. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Departments of Geology or Chemistry, must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Master of Science in the field of Engineering Geology—An interdisciplinary degree offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science.

Prerequisite: A Bachelor of Science degree in geology or a Bachelor of Science (Civil Engineering) degree from this University or an equivalent degree which must include those courses or their equivalents as outlined for the undergraduate requirements in the field of geology with the engineering option (engineering geology). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis. (Students wishing to work toward a Master of Science in the field of geotechnics and foundation engineering should consult the *School of Engineering and Applied Science Bulletin.*)

Required: (a) The general requirements, pages 89–97; (b) geology—at least 12 semester hours to include Geol 128, 141, 163, and 205; (c) engineering or physical science—at least 12 semester hours to be selected from ApSc 211, CE 204, 205, 206, 207, 208, 209, 216, 217, 218, 219, 221, 255, 256, 257, 263, 265, 275, 276; ME 221, 227, 231, 261, 262; EngS 228.

Doctor of Philosophy in the field of Geology—Required: the general requirements, pages 89–91, 97–99, including passing a reading knowledge examination in an approved foreign language and one other approved tool subject; and the satisfactory completion of the General Examination in three fields, one of which must be in petrology, stratigraphy, or structural geology.

Research fields: geomorphology, marine geology, mineralogy, paleontology, petrology, sedimentology, stratigraphy and structural geology.

Doctor of Philosophy in the field of Geochemistry (an interdepartmental degree offered by the Geology and Chemistry Departments)—Required: the general requirements, pages 89–91, 97–99, including passing a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91; and the satisfactory completion of the General Examination in four fields, including geochemistry and chemistry.

Bachelor of Arts in Education with a teaching field in Earth Science—Prerequisite: the education curriculum, pages 111–12.

Required: the earth science option and the professional courses listed on pages 115–16.

First Group

Staff

1–2 Introductory Geology for Nonscience Majors (3–3)

Lecture (2 hours), laboratory (2 hours). Survey covering the principles of geology; emphasis on human effect on the environment. Laboratory fee, $15 a semester. (Academic year)

5 Environmental Geology (3) — Siegel, Teleki

The relation of people and society to natural environment; population evolution and mineral resources; economic, legal, and political aspects. Laboratory fee, $15. (Fall and spring)

14 Mineralogy and Petrology for Nonscience Majors (3) — Carroll

Lecture (2 hours), laboratory (2 hours), field trips. Prerequisite: Geol 1 or permission of instructor. (Spring)

21–22 Physical and Evolutionary Geology (3–3) — Staff

Lecture and laboratory (5 hours). Principles of geology as a base for further study in geology and related sciences. Laboratory fee, $15 a semester. (Academic year)

ond Group

101 History of Geological Sciences (3) — Teleki

Development of scientific thought; history of geological and related sciences. (Fall)

111 Mineralogy (4) — Carroll

Lectures and laboratory. Morphological crystallography and systematic mineralogy. Prerequisite: Geol 1 or 21. Laboratory fee, $15. (Spring)

112 Crystal Optics (4) — Carroll

Lectures and laboratory. Optical phenomena of crystals and uses of the polarizing microscope. Prerequisite: Geol 111 or Phys 3, or permission of instructor. Laboratory fee, $18. (Fall)

113 Crystallography (3) — Appleman

Point-group and space-group theory, fundamentals of crystal structure, x-ray diffraction theory and application. Prerequisite: Math 31. Laboratory fee, $15. (Fall or spring)

117 Petrology (2) — Lewis

Introduction to silicate phase systems; physics and chemistry of crustal and magmatic processes, volcanic processes and products. Prerequisite: Geol 21, 111 12; Phys 1 or equivalent; or permission of instructor. (Spring)

118 Petrology Laboratory (2) — Lewis

Concurrent registration in Geol 117 required for geology majors. Prerequisite: Geol 111. Laboratory fee, $18. (Spring)

122 Structural Geology (3) — Carroll

Lectures and laboratory. Interpretation of geologic formations on basis of their structures. Prerequisite: Geol 22. (Fall)

123 Structural Geology Laboratory (1) — Staff

Solution of geometrical problems of structural geology. Prerequisite or concurrent registration: Geol 122. Laboratory fee, $10. (Fall)

125 Marine Geology (3) — Pierce

Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and

marine environment. Prerequisite: Geol 1–2 or 21–22; or permissio of instructor. (Spring)

128 Geomorphology (3) Telek

Lecture (2 hours), laboratory as arranged. Nature and evolution earth forms; principles of photointerpretation. Prerequisite: Geol 2 Laboratory fee, $15. (Spring)

132 Economic Geology (3) Turner

Genesis and distribution of mineral raw materials and their uses. Prerequisite: Geol 111. (Fall and spring)

136 Engineering Geology (3) Geiger

For students in the School of Engineering and Applied Science Geo logical principles and processes and their application to civil an mechanical engineering. Prerequisite: Math 31, Phys 2 or 4; or per mission of instructor. (Spring)

141 Introductory Geochemistry (3) Siege

Principles and theories on the abundance, relationships, and distrib tion of the elements in various rock and mineral species. Prerequ sites or concurrent registration: Geol 117 or equivalent; Chem 11 1 Math 30; Phys 1 or 3; or permission of instructor. Laboratory fee $5. (Fall)

151–52 Invertebrate Paleontology (3–3) Coates

Lecture and laboratory (5 hours), field trips as arranged. A sy tematic treatment of the invertebrate fossil groups, emphasis on the macroinvertebrates. Prerequisite: Geol 1–2 or 21–22; or permission o instructor. Laboratory fee, $15 a semester. (Academic year)

154 Vertebrate Paleontology (3) Hotton

Lecture (2 hours), laboratory or field work as arranged. General fea tures of vertebrate morphology and evolution; problems of paleo ecology and adaptation. (Fall)

158 Micropaleontology (3) Staff

Systematic and stratigraphic studies of important microbiota; suc surface methods. Special topics. May be repeated for credit wit permission of instructor. Laboratory fee, $12. (Spring)

163 Sedimentation (4) Lindholm

Lecture (2 hours), laboratory (4 hours), field trips as arranged. Prin ciples of sedimentation, analysis and interpretation of sedimentar processes and environment, laboratory experiments in the properti of sedimentary particles. Prerequisite: Geol 111 or permission instructor. Laboratory fee, $15. (Fall)

166 Principles of Stratigraphy (3) Coates, Kauffman

Stratigraphic principles and methods. Prerequisite: Geol 151 or per mission of instructor. (Fall)

181 General Oceanography (3) Maloney

Chemical and physical properties of sea water, movements of wat masses, meteorological interrelations, ecology of marine plants an animals. Prerequisite: Math 31 or equivalent, or permission of in structor. (Spring)

189 **Geophysics for Geologists** (3) Zietz
Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 21-22, Math 31, Phys 1 or 3; or permission of instructor. (Fall)

195 **Field Work** (2) Staff
Weekend field trips. Surveying, geological mapping, and specific field work methods. (Spring)

199 **Undergraduate Research or Reading** (arr.) Staff
Problems approved by the staff. May be repeated once for credit. (Fall and spring)

Third Group

205 **Seminar in Geology** (3) Staff
Special topics each semester. May be repeated for credit. (Fall and spring)

216 **Sedimentary Petrography** (3) Lindholm
Identification, classification, and interpretation of common sedimentary rocks by means of the petrographic microscope. Prerequisite: Geol 111, 163; or permission of instructor. Laboratory fee, $15. (Spring)

219 **Petrogenesis I** (3) Lewis
The origin of selected igneous and metamorphic rock types. Laboratory fee, $15. (Fall)

220 **Petrogenesis II** (3) Lewis
Laboratory fee, $15. (Spring)

224 **Advanced Structural Geology** (3) Lewis
Rock deformation. Methods of study and the formation of structurally complex rock. Tectonics. Prerequisite: Geol 122 or permission of instructor. (Fall)

241 **Geochemistry** (3) Siegel
Chemical composition and physical properties of sea water, chemical composition and alterations of marine sediments, thermodynamics and biochemical activity in oceans. Methods of analysis and problems of measuring. Prerequisite: Math 31 and permission of instructor. Recommended: Chem 22. Laboratory fee, $18.

243 **Geochemical Prospecting** (3) Siegel
Application of geochemical principles and analyses to the detection of hidden ore deposits. Field trips as arranged. Laboratory fee, $15. (Spring)

249 **Seminar: Geochemistry** (2) Siegel
Independent topics each semester; may be repeated for credit. (Fall or spring)

253 **Bioassociational Studies in Paleontology** (3) Hazel
Analysis and interpretation of the distribution of marine animals with emphasis on biogeographic, paleoclimatologic, and biostratigraphic inferences and multivariate techniques. (Fall)

254 **Interpretive Paleontology** (3) Kauffman
Comparative study of form and function in fossil and recent organisms as related to the interpretation of evolution. Prerequisite: Geol 151–52. (Spring)

255 **Population Paleoecology** (3) Buzas
Characteristics of populations applicable to the fossil record. Subject matter includes ecosystem concept, habitat, Hutchinsonian niche, life-death, size-frequency distributions, competitive exclusion principle, spatial distributions, relative abundance and diversity, quantification of community biofacies. Prerequisite: Geol 151–52, Stat 91, or permission of instructor. (Fall)

258 **Micropaleontology** (3) Sohn and Staff
Systematic studies of important microbiota. Prerequisite: Geol 158 or permission of instructor. (Fall)

266 **Stratigraphy** (3) Coates, Kauffman
Problems in physical and biological stratigraphy. Analysis of major facies types.

272 **Regional Geology** (2) Staff

288 **Geophysics of the Solid Earth** (3) Zietz
Physical properties and origin of surface features and the earth's interior. Admission by permission of instructor. (Fall)

295 **Research** (arr.)
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

GERMANIC LANGUAGES AND LITERATURES

Professors J.C. King, K. Thoenelt
Associate Professor C. Steiner *(Chairman)*
Associate Professorial Lecturer M.B. Guenther
Instructor B.K. Netland
Lecturers B. Gardner, P. Werres

Bachelor of Arts with a major in Germanic languages and literatures (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses—Ger 1-2, 3-4, 9-10, 51-52; or equivalent.
3. Required courses in other areas—six semester hours of history, and six semester hours in one of the following subjects: art history, music history, or philosophy.
4. Requirements for the major—a minimum of 24 semester hours in German courses above the first group, including Ger 179-80; reasonable proficiency in speaking, reading, and writing German.

Master of Arts in the field of Germanic Languages and Literatures—Prerequisite: a Bachelor of Arts degree with a major in Germanic Languages and Literatures from this University, or an equivalent degree.

Required: the general requirements, pages 89–97, including a reading knowledge of French. The program of study consists of (1) 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) in the field of German literature or linguistics or, with departmental approval, (2) 30 semester hours of approval course work without a thesis.

Bachelor of Arts in Education with a teaching field in German—Prerequisite: the education curriculum, pages 111–12.

Required: the German option and the professional courses listed on pages 115–16.

The Germanic Languages and Literatures Department, through the Consortium of Universities of the Washington Metropolitan Area, Inc., cooperates in a program leading to the degree of Doctor of Philosophy at Georgetown University.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

GERMAN

First Group

1–2 First-year German (3–3) **Staff**

Fundamental concepts of German culture; essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural-oral practice in language laboratory. Laboratory fee, $17.50 a semester. Prerequisite to Ger 2: Ger 1. (Ger 1 and 2—fall, spring, and summer)

***3–4 Second-year German** (3–3) **Staff**

Introduction to German civilization; selections from modern German prose; continuation and review of German structure; conversation and simple composition. Aural-oral practice in language laboratory. Laboratory fee, $17.50 a semester. Prerequisite to Ger 3: Ger 1-2 or equivalent. Prerequisite to Ger 4: Ger 3. (Ger 3 and 4—fall, spring, summer)

***9–10 German Conversation and Composition** (3–3) Guenther

(Academic year)

* With permission of instructor, Ger 9 or 10 may be taken concurrently with Ger 4.

47 **Beginning German for Reading Acquisition** (3) Staff
For undergraduates and graduate students with little or no Germa who are interested in acquiring a reading knowledge of German. No academic credit for graduate students. (Fall and summer)

49 **German Readings for Nonmajor Students** (3) Staff
Primarily for graduate students preparing for reading examinations. undergraduates admitted. No academic credit for graduate students Prerequisite: Ger 4 or 47, or equivalent. (Spring and summer)

51–52 **Introduction to German Literature—in English** (3–3) Guenther
Lecture, recitation, and discussion. Selected readings in German literature from the earliest periods to the present. (Academi year)

Second Group

103–4 **Major Themes of German Literature—in English** (3–3) Thoenelt
Lecture and discussion. Topics for 1978-79: Ger 103—the "Faust theme in German thought and civilization, from Goethe to Thomas Mann; Ger 104—the anti-Faust movement in German thought and civilization from Goethe to Heinrich Böll. (Academic year 1978-79 and alternate years)

111–12 **Comparative Studies in Germanic Literatures—in English** (3–3) Thoenelt
Lecture and discussion. Topics for 1977-78: Ger 111—Absurdity and rebellion, loss and rediscovery of the self, changing Gestalt concepts from Existentialism back to Enlightenment, selected works of Thomas Mann, Böll, Frisch, Hesse, Strindberg, Goethe and others. Ger 112 Why literature? What is literature? Views and perspectives on the "usefulness" and "uselessness" of literature in modern Western societies. From Plato to the 20th century. Selected works and excerpts from Plato, Aristotle, Horace, Shakespeare, Montaigne, Goethe, Schiller, Heine, Nietzsche, Thomas Mann, Sartre, Camus, Böll and others (Academic year 1977–78 and alternate years)

125 **Woman in German Literature—in English** (3) Guenther
Victim, catalyst, deity: an examination of selected works of 19th and 20th century German literature attempting to illuminate the peculiar role of woman in an essentially patriarchal artistic tradition. The paucity of genuinely creative female talents is contrasted with the brilliance of such catalytic figures as Bettina Brentano, Marianne von Willemer and Lou Andreas-Salomé. Readings from Goethe, Kleist Böll, Hesse. (Summer)

126 **France and Germany—in English** (3) Thoenelt
Comparative study of two European ways of life as reflected and perpetuated by literature and philosophy. Relevant excerpts and documents from the 16th to the 20th century. (Summer)

131–32 **18th Century German Literature—in German** (3–3) Thoenelt
Enlightenment, Storm and Stress, Classicism. Reading, lecture, and discussion. Central topic: *Geist und Tat*—or the 18th century concept of literature's formative function in society. (Academic year 1977–78 and alternate years)

141–42 **19th Century German Literature—in German** (3–3) Steiner

Romanticism, Biedermeier, young Germany, poetic realism. Second age of chivalry and *Sehnsucht*, revolution and counter-revolution in thought and literature. Birth and growth of modern nationalism and cosmopolitanism as reflected in the literature of the period. Reading, lecture and discussion. (Academic year 1978-79 and alternate years)

151–52 **20th Century German Literature—in German** (3–3) Steiner

The age of Nietzsche, Naturalism, Impressionism, Expressionism; Kafka, Thomas Mann, Hesse; émigré literature, contemporary drama; authors of Gruppe 47. Reading, lecture, and discussion. (Academic year 1977–78 and alternate years)

161–62 **Studies in Modern German Literature—in English** (3–3) Steiner

Readings of representative writers of modern German prose; lecture and discussion in English.

179–80 **Advanced German Conversation and Composition** (3–3) Thoenelt

Discussions and compositions on literary and cultural topics, readings of newspaper articles, interpretations of selected texts (Gottfried Benn and Thomas Mann), grammar and style studies. (Academic year 1978–79 and alternate years)

Third Group

201–2 **Middle High German** (3–3) King

(Academic year 1977–78 and alternate years)

209–10 **Old High German** (3–3) King

(Academic year 1978–79 and alternate years)

211–12 **History of the German Language** (3–3) King

Offered every third year. Next scheduled for academic year 1978-79.

213–14 **Old Norse** (3–3) Allee

(Academic year 1977–78 and alternate years)

225–26 **Seminar: Linguistics** (3–3) King, Allee

Bibliography, methodology, readings, and research problems. Offered as the demand requires.

231–32 **German Classicism** (3–3) Thoenelt

Advanced study and critique of the literature of the Goethe era. The 18th century image of man; literature and society; the regenerative function of aesthetics; and the establishment of criteria for "Kunst" and "Kitsch." (Academic year 1978–79 and alternate years)

251–52 **Seminar: Studies in 20th Century German Literature** (3–3) Steiner

Special projects in fiction, drama, poetry and criticism. Topic for 1978–79: *Das deutsche Drama der Gegenwart*. Analysis of *Weltanschauung* and themes in the major dramatic works of Brecht, Durrenmatt, Frisch, Grass, Hochhuth and Peter Weiss. (Academic year 1978–79 and alternate years)

*130 **Hospital Labor Relations** (3) Fisher

Brief history of unionism, characteristics of union organizations and union movements, and the basic reasons why the government became involved in employer-employee relations. Labor laws and National Labor Relations Board decisions as applied to health care facilities. Management's role in the collective bargaining process and the administration of and "living" with collective bargaining agreements.

*140 **Hospital Financial and Material Management** (3) Duny

Principles, practices, functions and objectives of financial and material management of hospital operations; emphasis on the role and contributions of middle management. Costs and budgetary control, responsibility accounting, cost-based budgets, purchasing, inventory control, distribution and storage.

142 **Financial Management in Health Care Institutions** (3) Duny

Consideration of the nature, analysis and interpretation of accounting data. Cost accounting, budgeting and internal control techniques, emphasis on their use in the management planning and control process.

153 **Survey of Health Care Organization** (3) Parker, Fisher

Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system. (Fall and spring)

154 **Introduction to Hospital Management and Procedures** (3) Parker, Black

Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and on the functions of the department manager. (Fall and spring)

*155 **Special Problems in Health Care Management** (3) Hayes

Supervised reading program in which the student is expected to review the literature on a middle-management problem present in contemporary American health care institutions.

*159 **Legal Issues in Health Care Administration** (3) Geer

Recognition and comprehension of areas of legal liability in hospital activities. Knowledge and understanding of a wide variety of administrative duties and responsibilities of a legal nature, such as administrative investigations, misconduct and line-of-duty determinations, administrative discipline and discharge, claims under the Medical Care Recovery Act, Federal Tort Claims Act, and other related matters.

*162 **Introduction to Hospital Information Systems** (3) Payton

(Formerly Survey of Hospital Information Systems)

Development and discussion of a computerized integrated information system, its effect on the environment and its use within the organizational system for planning and control. Analysis of actual information systems used in hospitals.

170 **Quantitative Methods in Health Care Administration** (3) Gordon

Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, com-

prehend, critically appraise and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than upon manipulating predeveloped formulas.

*175 **Analysis in Health Care Administration** (3) White, Gordon

Skills, methods, research and analysis of the middle management problem in health care administration.

*180 **Management Case Problems in Hospital Administration** (3) Collier, Bruhn

Management functions in the hospital setting. Management case problems in hospital administration areas such as authority relationships, communication barriers, motivation and productivity, and control techniques discussed and analyzed.

190 **Special Topics in Health Care Administration** (3)

Experimental offering at the undergraduate level. (Fall and spring)

Third Group

202 **Introduction to Health Care Systems** (3) McKelvey, Reeves

Lecture and discussion (2 hours), laboratory (2 hours). Introductory description and analysis of the American health and medical care systems. Organization, characteristics and relationships of research, technology, manpower, public and private delivery, and financing mechanisms. Survey of major disease problems and their impact on administration and planning. Medical terminology. (Fall and spring)

203 **Organization and Management of Health Care Institutions** (3) Darr, Hadley, McHugh

Lecture and discussion (2 hours), laboratory (2 hours). History and current character of institutional providers of health care. Function, organizational structure and interrelationships of various types of health care facilities. Institutional ethics; statistics. Regulation of institutional providers. (Fall and spring)

204 **Management of Health Maintenance Organizations** (3) Shouldice

Basic principles and fundamentals of prepaid group practice plans and newly forming health maintenance organizations. Emphasis on planning, development and operation of prepaid plans. (Fall and spring)

205 **Hospital Administrative Practices** (3) McDonald, McHugh

Lecture and discussion (2 hours), laboratory (2 hours). Organization, management and interrelationships of hospital clinical, support and administrative departments. Analyses of procedures and systems. Hospital personnel administration. Administrative ethics. Requirements of the Joint Commission on Accreditation of Hospitals. Prerequisite: HCA 203. (Fall and spring)

206 **Case Studies in Health Care Administration** (3) Devolites, Birnbaum, McHugh

Discussion (2 hours), laboratory (2 hours). Intensive qualitative and

quantitative analyses of major problem areas in health care administration using the case study method. Cases cover the broad spectrum of health care delivery and management: plans and operations, personnel, financial and materiel. Developing and implementing solutions serves as capstone course for health care administration students. Prerequisite: HCA 202, 203 and Mgt 201. (Fall and spring)

207 **Management Analysis in Health Care Institutions** (3) Shouldice, Bergwall, Reeves

Lecture (2 hours), laboratory (2 hours). Basic investigation and problem-solving techniques, including various methods of collecting, analyzing, reporting and using information that can be made available to administrators of hospitals and other medical care institutions. Field assignments. (Fall and spring)

209 **Health Resources Management** (3) Devolites, Birnbaum

Lecture (2 hours), laboratory (2 hours). Introduction to resource analysis, financial management and health economics/statistics of health care institutions. Estimates of health services demand and resource requirements. Preparation of budgets, financial statements and reports. Financial analysis. Public and private health insurance. Management of medical facilities and material. Regulation and containment of costs. Safeguarding hospital assets. (Fall and spring)

210 **Advanced Health Resources Management** (3) Devolites, Young

Development of financial health policies, objectives and programs. Application of PPBS in the health care field: financial management of multi-unit health care systems; financial aspects of national health programs, prospective rates and regulation of health prices; case studies and field research. (Fall or spring)

212 **Introduction to Health Planning** (3) Reeves, Bergwall, McKelvey

Lecture (2 hours), laboratory (2 hours). Introduction to the history and development of health planning in the United States. Presentation of basic health planning methods and procedures at a project level. (Fall and spring)

213 **Comparative Health Care Systems** (3) Gintzig

Comparative evaluations of various organizational patterns, functions and trends in international health care delivery systems. Emphasis on the sources of such differences and significance of the systems to the health care of a nation. Primarily for doctoral candidates; open to other students by special arrangement with the department. (Fall and spring)

214 **Health Systems Planning** (3) Reeves, Bergwall

Advanced planning techniques emphasizing quantative and rational methodology at the health systems level. In-depth discussion of selected critical components of the health planning process. Prerequisite: HCA 212, or permission of instructor. (Fall or spring)

216 **Seminar: Policy in Health Planning** (3) Reeves

Analysis of the legal, political, social and economic factors in health care planning, with emphasis on policy formulation and implementation. Explores the role of societal values in setting health policy. Prerequisite: HCA 212, or permission of instructor. (Fall or spring)

250 **Delivery of Mental Health Services** (3) Morris

Study of the organizations and systems for the delivery of mental health services; emphasis on administration, management and financial support of treatment and rehabilitation facilities. (Fall and spring)

260 **Introduction to Long-term Care Administration** (3) Wertlieb

Evolution of long-term institutions as a health care delivery subsystem. Comparative evaluation of characteristics of various long-term care institutions; regulation by government. Relationships between the purposes and functions of these institutions and the health care needs of the community are investigated. (Fall)

261 **Seminar: Managing the Long-term Care Institution** (3) Wertlieb

Designed to improve the abilities and effectiveness of health care administrators through a foundation of knowledge and skills in long-term health care facility organization and management. Emphasis on the range of services available in long-term care institutions. Prerequisite: HCA 260 or permission of instructor. (Spring)

†267 **Issues in Aging** (3) Reeves

(Formerly Social Gerontology for the Administrator)

The nature and problems of aging including the social, psychological, biological, economic, legal and health care needs and services of the older population. Designed primarily for graduate students in social sciences, health care administration, and for students in the medical school. Open to other students with consent of instructor. (Fall and spring)

270 **Research in Health Care Administration** (3) Gintzig, Reeves

Field research. Primarily for doctoral students, open to other graduate students with consent of instructor. May be repeated for credit. (Fall and spring)

285–86 **Readings in Health Care Administration** (3–3) Gintzig and Staff

Supervised readings in special areas of health care administration and planning. Primarily for doctoral students; open to other students by arrangement. May be repeated for credit. (Academic year)

287 **Health Care Administration and the Law** (3) Hirsh

Primarily for doctoral students; open to other students by arrangement. Legal duties and responsibilities, as well as rights of administrators and the health care facility, are outlined. Discussion of the legal relationships of facility personnel, legal aspects of labor relations and trends in hospital law. (Fall and spring)

288 **Field Problem Studies in Health Care Administration** (3) Gintzig, Reeves

Selected administrative and planning issues and problems arising in health care facilities. Primarily for doctoral students; open to other students by arrangement. May be repeated for credit. (Fall and spring)

† An interdisciplinary seminar jointly sponsored by the Departments of Health Care Sciences and Health Care Administration.

290 **Special Topics in Health Care Administration** (3) Staff
Experimental offering: new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

293–94
–95 **Residency I** (3–3–3) Staff
Twelve-month residency, beginning summer, fall or spring. Work experience under a qualified preceptor, periodic written progress reports, a written major report or a selected field project.

296–97
–98 **Residency II** (3–3–3) Gintzig
For selected students who take a second 12-month residency; begins summer, fall or spring.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral students preparing for the general examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

HEBREW

See **Classics.**

HISTORY

Professors R.H. Davison, R.B. Thompson, R.C. Haskett, R.P. Sharkey, H.M. Sachar, R.W. Kenney, P.P. Hill *(Chairman)*, L.G. DePauw, R. Thornton, L.G. Schwoerer
Professorial Lecturer O. Mayr
Adjunct Professor R.P. Multhauf
Associate Professors C.J. Herber, W.R. Johnson, R.A. Hadley, P.F. Klarén, A.D. Andrews, R.E. Kennedy, Jr.
Associate Professorial Lecturer A.L.K. Nelson
Assistant Professor L.P. Ribuffo

Bachelor of Arts with a major in history [field-of-study or departmental]—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the Humanities and the Natural and Mathematical Sciences.)

2. Required introductory courses—Hist 39–40, 71–72, or equivalent. Majors may waive one or more of the prerequisite courses by passing departmental examinations, by attaining scores of 600 or above on the College Entrance

Examination Board Achievement Tests, or by good performance on Advanced Placement Examinations. Credit for one or more of the prerequisite courses may be received by superior performance on departmental or Advanced Placement Tests.

3. Required courses in related areas—(a) either 12 semester hours of an approved foreign language or (b) nine semester hours in statistics (Stat 53, 100, 105, 110).

4. (a) *Field-of-study major*—Hist 199 (Proseminar), six semester hours of third-group courses, including at least three semester hours of research seminar, and the passing of the major examination in the senior year. In planning a program, the student, under the guidance of an advisor, should choose courses which will provide a broad understanding of diverse chronological and geographical aspects of the human experience.

(b) *Departmental major*—27 or more hours of second- and third-group courses, including Hist 199, six semester hours of third-group courses, including at least one research seminar, and six semester hours chosen from each of the following fields: I (Europe)—Hist 101, 105, 106, 109, 110, 111, 112, 121, 122, 123, 124, 127, 131, 132, 139, 140, 141, 142, 147, 149, 150, 151, 152, 153, 154, 157, 198, II (United States)—Hist 128, 129, 167, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 185, 186, 197; III (Russia, Asia, Africa and Latin America)—Hist 102, 108, 113, 114, 116, 137, 138, 143, 144, 145, 146, 158, 161, 163, 164, 165, 166, 187, 188, 189, 193, 194, 195, 196.

A pamphlet relating to the major is available in the offices of the dean of the Columbian College of Arts and Sciences and in the History Department.

An Honors Program may be chosen by juniors with satisfactory scholastic records. Application to this program must be made before the beginning of the second semester of the junior year. Students accepted into the program take a three-hour seminar in the second semester of the junior year and complete the research requirements for the history major by preparing the Senior Honors Thesis (Hist 191–92) in the final year of undergraduate study.

Master of Arts in the field of classical archeology, classics, and history (an interdepartmental degree program offered by the Art, Classics, and History Departments)—Prerequisite: a bachelor's degree with a background in classical archeology and either Greek or Latin. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 89–97. The program of study consists of 24 semester hours of course work (as many as possible should be third-group courses) selected in consultation with the appropriate advisor from the Art, Classics, and History Departments; plus a thesis (equivalent to six additional semester hours). Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

Master of Arts in the field of history—Prerequisite: a bachelor's degree from an accredited college or university with a major in history, or an equivalent degree; high scholastic standing; and approval of the department. Applicants from other institutions must present scores on the Graduate Record Examination with the Advanced Test in History and arrange for four persons, preferably former instructors, to send letters or reference forms to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 89–97. The program of study consists of (1) a minimum of 30 semester hours of second- and third-group courses, including Hist 299–300 *Thesis Research*, or (2) a minimum of 36 semester hours of second- and third-group courses, including at least two research seminars (six semester hours). At least six semester hours of each candidate's program must be in third- or fourth-group history courses; a maxi-

mum of six may be in approved courses outside the History Department. To receive graduate credit, master's candidates must arrange for extra work with the instructors in order to receive graduate credit for such courses. Each student works in two fields of history and is required to pass a Comprehensive Examination in each.

Doctor of Philosophy in the field of history.—Required: the general requirements, pages 89–91, 97–99, including the passing of a written examination in two appropriate foreign languages, or one foreign language and an approved tool subject, and the satisfactory completion of the General Examination in four fields. Normally, each doctoral candidate will work in one major (or general) field of study and three special fields. The major fields include the following: ancient history, medieval Europe, early modern Europe, modern Europe, United States, Latin America, modern Near East, modern Far East, Russia and East Europe. Special fields may vary from the topical (e.g., U.S. social history, European intellectual history, etc.) to the chronologically limited fields (e.g., American colonial history, Tudor and Stuart England, etc.). A student may elect one special field outside of the History Department if it is relevant to the program.

Doctor of Philosophy in international relations. See page 355. This degree program combines work in economics, history, and political science.

Bachelor of Arts in education with a teaching field in history.—Prerequisite: the education curriculum, pages 111–12.
Required: the history option and the professional courses on pages 115–16

Departmental Prerequisite: Students are expected to bring to second-group courses an appropriate level of background preparation. Ordinarily, this is achieved by successful completion of first-group courses in the same area or by presenting evidence of equivalent preparation. Students lacking such preparation may take second-group courses only with the consent of the instructor.

First Group

39–40 **European Civilization in Its World Context** (3–3) Staff
Hist 39: political, social, economic, and cultural history to early modern era. Hist 40: from early modern era to present. (Academic year)

71–72 **Introduction to American History** (3–3) Staff
Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present. (Academic year)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101–2 **History of Revolution** (3–3) Thompson
Hist 101: revolution as a theme in world history from ancient times

* An interdepartmental course offered by the History, East Asian Languages and Literatures, Economics, Geography and Regional Science, Philosophy, Political Science, and Religion Departments.

to Luther, Cromwell, and Robespierre. Hist 102: revolution and the revolutionary movement in the age of Marx, Lenin, and Mao. (Academic year)

105–6 **History of Science and Technology** (3–3) Multhauf, Mayr

Hist 105: from ancient natural philosophy through the 17th century scientific revolution. Hist 106: from the Industrial Revolution to the 20th century amalgamation of science and technology. Emphasis alternates between science and technology in successive years. (Academic year)

108 **The Ancient Near East and Egypt to 322 B.C.** (3) Hadley

Survey of Egyptian, Mesopotamian, Anatolian, West Semitic, and Iranian civilizations from the Neolithic period to Alexander's conquest.

109 **Early Aegean and Greek Civilizations to 338 B.C.** (3) Hadley

Neolithic background: Bronze age—Minoan, Helladic, and Mycenaean civilizations; classical Greek civilization to the Macedonian conquest. (Fall)

110 **The Roman World to 337 A.D.** (3) Hadley

Prehistoric Italy; rise and decline of the Roman Empire and Latin civilization; cultural, social, and political developments in the Greek world under Roman rule. (Spring)

111–12 **Medieval History** (3–3) Andrews

Development of the Latin Christian community. Hist 111: 4th to 11th century. Hist 112: 11th to 14th century. (Academic year 1977–78 and alternate years)

113–14 **Byzantium and Its Neighbors** (3–3) Andrews

Mediterranean region from fourth to 15th century: Byzantium, Islam, Crusades, advance of the Turks. (Academic year 1978–79 and alternate years)

116 **History of Africa** (3)

Survey of political, cultural, and economic development from ancient times to the present. (Spring)

119 **China in the 20th Century: Reform and Revolution** (3) Johnson

Origins, goals, substance, and significance of political, social, and intellectual upheavals in China from 1900 to the present. (Summer)

121 **The Renaissance in Western Europe** (3) Schwoerer

The Renaissance City, concepts of the ideal man and woman, the discovery of new worlds, Machiavelli, historiography of the period.

122 **The Reformation in Western Europe** (3) Herber

Religious, political, and social consequences of the theological upheavals of the 16th century. (Spring)

123–24 **European Intellectual History** (3–3) Kennedy

Philosophy, political, and economic thought, cultural developments, popular culture, diffusion of ideas. Hist 123: 17th and 18th centuries. Hist 124: 19th and 20th centuries.

*127 **Theories of History** (3) — Lavine

Major philosophies of history: Judeo-Christian, idea of progress, historicism, Hegelian-Marxist dialectic, cyclical (Vico, Spengler, Toynbee), and social-scientific (Kant, Weber) views. Contemporary problems of historical knowledge. (Fall)

128–29 **War and Society: The Anglo-American Experience Since 1776** (3) — McDonald

Interaction of wars, armed forces, and defense policies with politics and society in Great Britain and the U. S. since the Revolutionary War. Hist 128: from 1776 to 1918. Hist 129: 1919 to the present. (Academic year)

131–32 **History of Germany** (3–3) — Herber

Political, social, and cultural development. Hist 131: from mid-17th century to Bismarck. Hist 132: from William II to present.

137 **U.S.-Soviet Strategic Relations Since World War II** (3) — Thornton

Survey of U.S.-Soviet global rivalry from World War II to the present. (Spring)

138 **History of World Communism** (3) — Thornton

The international communist movement from its beginnings to the present.

139–40 **World History in the 20th Century** (3–3) — Sachar

Diplomatic, political, and cultural factors. Hist 139: from the turn of the century to the Munich settlement of 1938. Hist 140: from the Munich settlement to present.

141–42 **History of France** (3–3) — Kennedy

Political, social, and cultural development. Hist 141: Old Regime, French Revolution, and Napolean. Hist 142: from Napolean to present. (Academic year)

143 **Europe East of the Elbe, 1815-1939** (3) — Staff

Poland, the Danube countries, and the Balkans in the 19th and 20th centuries. (Fall)

144 **Medieval Russia** (3) — Staff

Russian history from its beginnings to the reign of Peter the Great. (Spring)

145 **Imperial Russia** (3) — Thompson

From the reign of Peter the Great to World War I. (Fall)

146 **Soviet Russia** (3) — Thompson

The Russian Revolution and Soviet rule to the present. (Spring)

†147 **Economic History of Europe** (3) — Sharkey

Economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

* An interdepartmental course offered by the History and Philosophy Departments.
† An interdepartmental course offered by the History and Economics Departments.

148 The French Revolution (3) **Kennedy**
Social, political, economic, and cultural history of the decade of revolution, 1789–1799. Attention to its structural consequences in France and in Europe-at-large. (Summer)

149–50 European Diplomatic History (3–3) **Davison**
Emphasis on policies and actions of the great powers and their statesmen. Hist 149: 1812 to 1890. Hist 150: since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157. (Academic year)

151–52 History of England (3–3) **Kenny**
Development of English civilization and its impact on Western culture. Hist 151: to 1689. Hist 152: since 1689. (Academic year)

153 Tudor England (3) **Kenny**
Aspects of the constitutional, social, intellectual, economic, and religious development of England, 1485-1603.

154 Stuart England (3) **Schwoerer**
Grand Rebellion, Restoration, and Glorious Revolution. The political, religious, intellectual, social, and economic development of England, 1603–1714. (Spring)

156 Winston Churchill as War Leader (3) **McDonald**
Churchill's role from subaltern to prime minister in the British Empire's wars during his lifetime, with special attention to the two world wars. (Summer)

157 20th Century European Diplomatic History (3) **Sachar**
The main currents, with necessary 19th century background. Students who receive credit for Hist 157 cannot receive credit for Hist 150. (Fall)

158 Modern Jewish History (3) **Sachar**
A secular history of the Jewish people from the 18th century to the present state of Israel; emphasis on European political, economic, and cultural influences. (Fall)

161 Revolution in 20th Century Latin America: the Mexican and Cuban Experience (3) **Klarén**
Social, economic, and political forces working to undermine the traditional fabric of Latin American society; emphasis on historical roots of revolutionary movements. (Spring)

163–64 History of Latin America (3–3) **Klarén**
Political, socioeconomic, and cultural development. Hist 163: colonial period. Hist 164: national period. (Academic year)

166 History of Mexico (3) **Klarén**
Political, socioeconomic, and cultural aspects from pre-Columbian times to the present. (Fall)

167 Man-made America: the Colonial Scene (3) **Haskett**
The setting and shape of life in early America. (Spring)

169 **The American Revolution** (3) DePauw
The political, intellectual, social, military, and economic significance of the events leading to the War for American Independence and the adoption of the federal Constitution. (Fall)

170 **U.S. Early National History** (3) Hill
Political, diplomatic, economic, and social history of the early republic, 1789–1828. (Fall)

171–72 **U.S. Social History** (3–3) Staff
Hist 171: daily life, institutions, intellectual and artistic achievements of the Agrarian Era, 1607 1861. Hist 172: the Urban-Industrial Era from 1861 to present.

173–74 **Afro-American History** (3–3) Staff
The role of black Americans in United States history. (Academic year)

175–76 **U.S. Political History** (3–3) Haskett
Hist 175: to the Civil War. Hist 176: Civil War to 1960. (Academic year)

177 **The Ante-bellum South** (3) DePauw
Political, economic, intellectual, social, and cultural characteristics of the American South before the Civil War. (Spring)

178 **Recent U.S. History** (3) Ribuffo
Political, social, and intellectual history from 1890 to the present. (Fall)

*179–80 **U.S. Economic History** (3–3) Sharkey
Economic growth from colonial times to the present. Development of various sectors in the economy and their interdependence. Hist 179: 1607 1865. Hist 180: from 1865 to present. (Academic year)

181–82 **U.S. Diplomatic History** (3–3) Hill
American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century. (Academic year)

183 **American Intellectual History** (3) Ribuffo
Aspects of social and political theory, religious thought, literary criticism, and popular psychology from the late 19th century to the present. (Summer)

184 **American Secretaries of State in the 19th Century** (3) Nelson
Biographical approach to U.S. diplomatic history. Emphasizes impact of individual secretaries and their relations to the presidents. Readings and discussions. (Summer)

185 **History of Women in America** (3) Staff
Political, economic, social, military, religious, intellectual, and cultural activities of women in America from 1000 A.D. to the present. (Spring)

186 **U.S. Urban History** (3) [Same as AmCv 186] Gillette
Development and characteristics of American cities. (Fall)

* An interdepartmental course offered by the History and Economics Departments.

187 **History of Modern China** (3) Johnson
China since 1840, particular attention to political developments. (Fall)

188 **History of Chinese Communism** (3) Thornton
Leadership, ideology, structure, and operation of the Chinese revolutionary movement from its founding to the present. (Fall)

189 **History of Modern Japan** (3) Sigur
Japan's century of modernization—from the Meiji Restoration of 1868 to the present. Emphasis on historical, political, economic, and cultural factors. (Fall)

190 **Readings in the History of the Modern Middle East** (3) Davison
Politics, societies, and cultures of the area, including problems of modernization and international relations. (Summer)

191–92 **Senior Honors Thesis** (3–3) Staff
Required of and open only to undergraduate honors candidates in history. (Academic year)

193 **History of the Near East** (3) Davison
Byzantine, Arab, Persian, and Islamic backgrounds, rise and decline of the Ottoman Empire; action of European powers in the area; Ottoman breakup into the Turkish Republic and other states. (Fall, odd years)

194 **History of the Modern Near East** (3) Davison, Sachar
Beginning with Napoleon's invasion of Egypt. Development of nationalism and of modern states; impact of the West on culture and institutions; great-power imperialism, crises of Turkish Straits, Suez, Arab-Israeli relations; and other issues. (Fall)

195–96 **History of East Asia** (3–3) Johnson
Civilizations of China and Japan; emphasis on institutional development. Hist 195: beginnings to about 1800. Hist 196: from eve of the modern era to present. (Academic year)

197 **Oral History and Interview Techniques** (4) Staff
Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area.

198 **Special Topics in History** (3) Staff
Historical perspectives on great issues of past and present. New topic each semester.

199 **Proseminar: Readings for the History Major** (3) Staff
Required of senior history majors. Readings and discussions on major trends in history; representative selections from the classics of historical literature. Students who receive credit for Hist 199 cannot receive credit for Hist 201. (Fall and spring)

Third Group

Prerequisite to all third-group history courses: the appropriate second-group preparation and consent of instructor.

201 History and Historians (3) Staff

Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199. (Fall and spring)

203–4 Research Seminar (3–3) Staff

Offered on demand for individual research programs. Prerequisite: approval of department. (Academic year)

205 Evolution of Nationalism in Eastern Europe (3) Petrov

Formation of national consciousness and emergence of modern East European states after World War I. Developments of the interwar period. Open to qualified undergraduate seniors. (Fall)

206 Revolution in Eastern Europe (3) Petrov

Transformations of East European states during World War II. Resistance movements, communization, and national self-assertion in the immediate post-Stalin period. Open to qualified undergraduate seniors. (Spring)

207 Seminar: the Communist Party of the Soviet Union (3) Staff

Readings and discussions. Evolution of the Communist movement in Russia. Party origins, growth, and organization; intra- and inter-party strife. (Spring)

209–10 Seminar: Topics in Ancient History (3–3) Hadley

Readings and discussions on general topics in the history of the ancient Near East, Greece, or Rome. Topics to be announced in the *Schedule of Classes*. Students with working knowledge of the appropriate language(s) may receive research credit.

211–12 Seminar: Medieval History (3–3) Andrews

Prerequisite: Hist 111 12 or equivalent. Students with working knowledge of Latin may receive research credit. Each semester will focus on a particular area and period, with emphasis on interdisciplinary research techniques. (Academic year)

***213 Comparative Communist Systems I (3)** Petrov

Ideological foundations of communism, emergence of the Soviet system; development of the international communist movement to World War II; postwar formation of the Soviet bloc. (Fall)

***214 Comparative Communist Systems II (3)** Hinton

Comparative analysis or major recent ideological trends and political institutions and behavior among ruling and nonruling Communist Parties. (Spring)

215 Transformation of the Socialist Commonwealth (3) Petrov

Soviet relations with East European and Asian socialist states from the end of World War II to the Sino-Soviet split. Changes in substance and form in relations among ruling Communist parties. Open to qualified undergraduate seniors. (Summer)

* An interdepartmental course offered by the History and Political Science Departments.

216 **U.S.-Soviet Strategic Relations since World War II** (3) Thornton
Discussion seminar designed to develop a conceptual framework for understanding contemporary U.S.-Soviet relations.

217–18 **Seminar: Russian and Soviet Thought** (3–3) Staff
Readings and discussions. Selected topics in the intellectual and social history of 19th and 20th century Russia. Topical and diachronic approach.

224 **European Intellectual History** (3) Kennedy
Cultural history of the French Revolution. Interrelated changes in political and economic thought, theater, arts, religion, and science from 1789 to 1799. Continuity or discontinuity with pre- and post-revolutionary cultural life. (Spring)

*255 **History of Washington, D.C.** (3) Staff

228–29 **Modern Military and Naval History** (3–3) McDonald
Research seminar in 20th century British and American military history; special attention to the interaction during peace and war of strategy, diplomacy, and national policy.

†231 **Seminar: Sino-Soviet Relations** (3) Michael
Background, development, and status of conflict within the communist movement; emphasis on the role of Chinese communists. Prerequisite: three semester hours selected from Hist 91, 187; PSc 170; or equivalent. (Spring)

237 **Seminar: Soviet Foreign Policy, 1917-1960** (3) Petrov
Concepts and perceptions guiding Soviet relations with the outside world. From the blockade and intervention, through years of isolation, World War II, the Cold War, to "peaceful co-existence" and detente. Open to qualified undergraduate seniors. (Fall and summer)

239–40 **Early Modern European History** (3–3) Schwoerer
Readings, discussions, and research on selected topics.

241–42 **Research Seminar: Modern European History** (3–3) Herber
Prerequisite: appropriate preparation and consent of instructor.

245 **Studies in Revolutionary History** (3) Thompson
Topic for 1978: women and revolution. Focus on the Russian Revolution, but other revolutions included. (Spring)

246 **Seminar: Modern Russian History** (3) Staff
Discussions, readings, research. Selected topics in the domestic history of modern Russia. (Fall)

247 **The Theory and Practice of Modern Imperialism** (3) Sharkey
Critical analysis of Marxist and non-Marxist theories of modern imperialism in the light of late 19th and 20th century European and American experiences in Asia, Africa, and Latin America. (Fall)

* Offered jointly by the Department of History and the American Studies Program.
† An interdepartmental course offered by the History and Political Science Departments.

248 **Reading Seminar: Modern European and Near Eastern History** (3)
Admission by permission of instructor.

249–50 **European Diplomatic History** (3–3) Davison
Research seminar in individually selected topics concerning the foreign policies, actions, and interrelations of the European great powers and their statesmen in the 19th or 20th centuries. Reading knowledge of one language other than English required.

251–52 **English People and Institutions** (3–3) Kenny, Schwoerer
(Formerly Research Seminar: English History)
Research seminar. Selected topics in the political, social, intellectual, and economic history of England. Each semester will focus upon one time period and special area of interest.

261 **The Structure of Latin American Politics** (3) Klarén
(Formerly Research Seminar: Latin American History)
Readings, discussion, and research focusing on the relationship, since independence, of the Latin American body politic to such developments as corporatism, modernization, millenarianism, caudillismo, and populism. (Fall)

271–72 **U.S. Social History** (3–3) Staff
Discussion seminar on American daily life, institutions, and intellectual and artistic achievements.

*273–74 **Research Seminar: Materials in Afro-American Culture** (3–3) Staff
Prerequisite: Hist 173–74 or equivalent. (Academic year 1978–79 and alternate years)

275–76 **U.S. Political and Colonial History** (3–3) Haskett
Research seminar. Topics, depending on student interest, selected from various aspects of the colonial period and from political aspects of various periods. Admission by permission of instructor.

†277–78 **Historic Preservation** (3–3) Gutheim
The preservation movement and its literature. Review of current experience, preservation practice, and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. (Academic year)

279 **Research Seminar: American History** (3) Staff
Admission by permission of instructor.

280 **Research Seminar: Women in the United States** (3) DePauw
Prerequisite: Hist 170, 175, or 181; or equivalent.

281–82 **Research Seminar: U.S. Diplomatic History** (3–3) Hill
Prerequisite: Hist 181–82 or equivalent. (Academic year)

283–84 **Research Seminar: Recent U.S. History** (3–3) Ribuffo
Prerequisite six semester hours of 100-level American history courses (Hist 283—fall)

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* Offered jointly by the History Department and the American Studies Program
† Joint offering of the History and Urban and Regional Planning Departments and the American Studies Program.

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the methodology of a chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

288 **History of Chinese Communism** (3) Thornton
Research seminar on selected topics. (Spring)

289 **Seminar: Modern Japanese History** (3) Sigur
Discussion and research on selected topics in modern Japanese history from the Meiji Restoration of 1868 to the present. (Spring)

291 **Seminar: 20th Century History** (3) Sachar
Research. Topic for 1977: era of World War I. (Fall)

292 **The Palestine Question in Modern History** (3) Sachar
Research seminar. (Spring)

294 **Seminar: the Modern Near East** (3) Davison
Readings, discussion, and research in selected political, economic, social, cultural, and international developments in the 19th and 20th centuries.

295–96 **The Modern Far East** (3–3) Johnson
Research seminar.

297 **Confrontations in 20th Century European and Middle Eastern History** (3) Sachar
Reading and research. Crisis periods of contemporary history. Special attention to the eras of the world wars and to the impact of Western and Soviet involvement in the Mediterranean and Middle East. (Summer)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Prerequisite to all fourth-group history courses: the appropriate second-group preparation and consent of instructor.

Fourth-group history courses are primarily for doctoral students, but master's degree candidates may be admitted.

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. The policies of the Institute are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 309. Seminar titles for the 1977–78 academic years are listed below. Students wishing to register for these courses should consult the chairman of the History Department.

301–308 **Folger Institute Seminars** (3 each) Staff
Topics will be announced.

321–22 **Readings in Early Modern History** (3–3) Schwoerer, Herber

341–42 **Readings in Modern European History** (3–3) Davison
(Hist 342—spring)

345 **Readings in Russian History** (3) Thompson

*373–74 **Readings on the Negro in American Culture** (3–3) Staff
(Academic year 1976–77 and alternate years)

375–76 **Readings in U.S. Political History** (3–3) Haskett
(Hist 375—fall)

†379–80 **Readings in Economic History** (3–3) Sharkey
Hist 379: American economic history. Hist 380: modern European economic history. (Academic year)

381–82 **Readings in American Diplomatic History** (3–3) Staff
(Hist 382—fall)

385 **Readings in History of Women in America** (3) DePauw
(Spring)

386 **Readings in Early American History** (3) DePauw
(Fall)

387–88 **Readings in the History of Sino-Soviet Relations** (3–3) Thornton
(Hist 388—fall)

395–96 **Readings in Modern Far Eastern History** (3–3) Johnson

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

HUMAN KINETICS AND LEISURE STUDIES

Professors L.M. Stallings, J.L. Breen *(Chairman)*, D. Hawkins
Professorial Lecturers M.R. Hanson, E.L. Shafer, R. Anzola-Betancourt, C.A. Troester, Jr.
Associate Professors L.H. George, J.E. Snodgrass, M.R. Withers, A.L. Dickerson *(Research)*
Adjunct Associate Professors D.C. Paup, P.J. Verhoven
Associate Professorial Lecturers J.W. Eberhard, T. Songster, D.M. Compton
Assistant Professors H. Nashman, N.D. Johnson
Assistant Professorial Lecturers B.S. Katz, S.Y. Cha, L. Houstoun, Jr., P.G. Davidoff, J. Kelley, D.L. Edgell
Lecturers M.M.H. Ramsay, J. Sellars, M.H. Svehla, M.K. Elbin, L.K. Johnson, S.N. Smith, E.A. Burkhardt, J.V. Ackerman, K. Cotton, J.J. Goldblatt
Instructors D.C. Park *(Research)*, J.B. Isaacs *(Research)*

Programs of study leading to the degrees of *Bachelor of Science in Human Kinetics and Leisure Studies* (opportunity for specialization in elementary and

* Offered jointly by the History Department and the American Studies Program
† An interdepartmental course offered by the History and Economics Departments

secondary school physical education or dance). *Master of Arts in Education* (field in human kinetics and leisure studies with specialization in adaptive physical education, dance, movement studies of children, secondary school physical education, therapeutic recreation, tourism, or urban recreation and parks) are offered by the School of Education (see pages 101–27).

From three to four semester hours of first-group human kinetics and leisure studies courses are required for bachelor's degree candidates in the education and human kinetics and leisure studies curriculum.

The University is not responsible for injuries received in any of the activities of the Department of Human Kinetics and Leisure Studies, and the student assumes full responsibility therefor.

First Group

Courses numbered from 1 to 49 are beginning activities courses and require a minimum of 24 clock hours of instruction.

Courses numbered from 50 to 100 are for students who wish in-depth training in a particular activity. They require a minimum of 48 clock hours of instruction.

Students whose medical examinations indicate the desirability for remedial or restricted activity are assigned to programs especially adapted to their needs. Unless otherwise indicated, all first-group courses are offered both in the fall and spring semesters.

All first-group courses may be repeated with permission of the instructor.

10 Beginning Badminton (1)	**Breen**
11 Beginning Bowling (1)	**Staff**
12 Introduction to Ballet (1)	**Staff**
13 Beginning Ballet Technique (1)	**Staff**
14 Beginning/Intermediate Ballet Technique (1)	Svehla
15 Beginning/Advanced Ballet Technique (1)	Svehla
16 Introduction to Modern Dance (1)	**Staff**
17 Beginning Modern Dance Technique (1)	Staff
18 Beginning/Intermediate Modern Dance Technique (1)	Staff
19 Ethnic Dance (1)	**Staff**
20 Beginning/Intermediate Golf (1)	Staff
21 Foil Fencing (1)	**Snodgrass**
22 Basketball (1)	**Hanken**
24 Volleyball (1)	**Hanken**
26 Beginning Karate (Korean Style) (1)	Cha
27 Beginning Tennis (1)	**George**
28 Beginning/Intermediate Karate (Korean Style) (1)	Cha
29 Yoga (1)	**Staff**
30 Body Conditioning (1)	**Snodgrass**

31 **Backpacking** (1) — Staff

32 **Beginning Swimming** (1) — Staff

33 **Swimming/Life Saving** (1) — Staff

35 **Slimnastics and Weight Training** (1) — Staff

36 **Springboard Diving** (1) — Staff

37 **Soccer** (1) — Hanken

38 **Racketball** (1) — Staff
(Formerly Paddle Ball)

39 **Handball** (1) — Staff

40 **Squash** (1) — Staff

41 **Soccer** (1) — Staff

50 **League Bowling** (1 or 2) — Staff
Emphasis on competitive bowling as a lifetime sport.

51 **Gymnastics** (2) — Staff
Emphasis on apparatus and trampoline.

52 **Modern Dance Technique I** (2) — Staff

53 **Modern Dance Technique II** (3) — Staff
Admission by permission of instructor.

54 **Intermediate/Advanced Tennis** (2) — George
Development of skills, theories of strategy; emphasis on competitive play as a lifetime sport.

55 **Swimming—Water Safety Instruction** (2) — Staff

56 **Scuba Diving** (2) — Staff
Laboratory fee, $100.

57 **Intermediate/Advanced Badminton** (2) — Breen
(Spring)

58 **Intermediate Ballet Technique** (2) — Fusillo

59 **Team Sports** (2) — Staff
(Fall)

60 **Racket Sports** (2) — Staff
(Spring)

61 **Aquatics** (2) — Staff
(Fall)

62 **Conditioning/Weight Training** (2) — Staff
(Spring)

63 **Games and Movement Activities for Children** (2) — Staff
(Spring)

64 **Horseback Riding** (2) **Staff**
Laboratory fee, amount announced in *Schedule of Classes.*

65 **Skiing** (2) **Staff**
Laboratory fee, amount announced in *Schedule of Classes.* (Spring)

66 **Synchronized Swimming** (2) **Staff**

Second Group

101 **Physical Education and Sports in Human Resource Centers** (3) Snodgrass
(Formerly Physical Education in the Elementary School)
Development of physical education and sports programs in schools and play settings. Includes philosophy and curriculum

102 **Movement Education** (3) **Snodgrass**
Techniques of teaching movement education with emphasis on problem-solving methods for kindergarten and grades 1–6. (Fall)

103 **Professional Foundations and Concepts of Human Kinetics and Leisure Studies** (3) Snodgrass
Nature and scope of human kinetics and leisure studies; scientific bases of physical education and athletic programs; orientation to professional competencies.

104 **Introduction to Travel and Tourism** (3) Davidoff
Survey of the travel and tourism industry with emphasis on the travel agency, marketing tourism and travel and the economic and social why tourists travel, development of tourist destinations, the travel agency, marketing tourism and travel, and the economic and social impact of tourism. (Travel)

105 **Introduction to Adaptive Physical Education and Therapeutic Recreation** (3) Park
Philosophy, methods, and concepts relating to recreation and adaptive physical education for the ill, aged, and disabled. Concepts in program planning, leadership, and adaptations of activities to special groups. Includes field visitation and analysis of activities. (Fall)

106 **Introduction to Dance Therapy** (3) **Staff**
General survey of dance therapy areas from theoretical and experimental points of view. Exploration of professional opportunities. (Spring)

107 **Teaching Ethnic Dance** (2) **Johnson**
Methods and materials for teaching the folk and social forms of dance. (Spring)

108 **Dance Improvisation** (2) **Staff**
Awareness of body movements, environment, group dynamics, performance and composition through improvisational technique. (Fall and spring)

109–10 **Dance Composition** (3–3) **Withers**
HKLS 109: basic elements and principles of compositions. HKLS 110: advanced problems in composition. (Academic year)

111–12 **Sports Education Technique** (3–3) Staff
Techniques for teaching individual, dual and team sports. (Academic year)

113–14 **Practicum in Physical Education, Dance or Leisure** (3–3) Staff
(Formerly Field Experience: Practicum in Physical Education, Dance or Recreation)
Pre-practice teaching or leadership in elementary or secondary school physical education; adaptive physical education, dance or leisure settings. Seminars relating to field experiences. (Academic year)

116 **Mime Movement and Theater** (1) Ramsay
Psychological improvisation, improvisation with masks, Commedia dell'Arte, Pantomime Blanche, chorus work, clown work. May be repeated for credit. (Spring)

117 **Dance Education** (3) Johnson
Organizational, methodological, philosophical and conceptual approaches to the teaching of dance in academic and nonacademic settings. Prerequisite: HKLS 157. (Fall)

118 **Special Problems in Dance Composition** (1) Staff
Work with elements of movements leading to short composition studies.

119 **Creative Dance for Children** (3) Withers
Dance as an expressive art medium for children: concepts, principles, methods and materials. Emphasis given to dance in elementary education with consideration for special education. (Spring)

120 **Repertory** (1 or 2) Isaacs
Study and performance of dance works. Admission by permission of instructor. May be repeated for credit.. (Fall and spring)

121 **Dance Technique III** (1 to 3) Staff
Intermediate advanced modern dance. Admission by permission of instructor. May be repeated for credit. (Fall and spring)

122 **Methods and Materials for Health Education** (3) Staff
Conceptual approach to curriculum design and teaching, including planning and organization, methodology, selection and use of materials and evaluation; basic health knowledge. (Fall and spring)

123 **Dance Technique IV** (2 or 3) Withers
Advanced modern dance. Admission by permission of instructor. May be repeated for credit. (Fall and spring)

124 **Movement Technique for Theater** (1) Ramsay
Analysis of movement, dramatic justification of movement; mime technique; respiration and its integration with movement. (Fall)

129 **Introduction to Motor Learning** (3) Stallings
Concepts of motor skill learning applied to the teaching of movement skills. (Fall)

130 **Motor Performance in Childhood** (3) Snodgrass
Study of the evolvement and refinement of fundamental movement skills. (Spring)

133 **Student Teaching** (6 to 12) Nashman
Prerequisite: HKLS 113–14 or equivalent. Admission by permission of instructor. (Fall and spring)

135–36 **Dance History** (3–3) Johnson
Study of dance from antiquity to present; emphasis on cultural significance of dance as art form, symbolic form, and social behavior. (Academic year)

137 **Dance Notation and Movement Analyses: The Laban System** (3) Katz
Concepts and applied principles of Laban's theories of movement (or Laban analyses) with emphasis on Labanotation. (Spring)

138 **Curriculum, Organization and Administration of Physical Education and Athletics** (3) George
(Formerly Physical Education Curriculum and Administration)
Curriculum and administration related to physical education and athletic programs. Professional ethics. (Fall)

139 **Coaching Behavior** (3) Snodgrass
(Formerly Teacher Behavior)
Study of behavioral patterns and interactions related to individual and team sports. (Spring)

141–42 **Theater Production for the Dance** (2–2) Staff
Theories and practicum in technical aspects of dance production. HKLS 141: lighting, sound and theater management. HKLS 142: costuming, make-up, sets, props, and audiovisual techniques. (Academic year)

144 **Choreography** (3) Isaacs
Solo and group. May be repeated for credit. (Fall and spring)

150 **Human Anatomy** (3) Stallings
Systematic study of the structure of the human body; emphasis on kinesiological anatomy, including joints, muscles, and neuromuscular integration. Laboratory fee, $15. (Fall)

151 **Kinesiology** (3) Paup
Analysis of human movement, including mechanical physics, anatomy, and physiology. Prerequisite: approved course in anatomy. (Spring)

152 **Environment, Leisure, and Quality of Life** (3) Staff
Environmental problem-solving through ecological and social planning; concentration on the impact of leisure on total human physical and cultural development; emphasis on philosophical considerations. (Fall)

156 **Application of Recreational Skills to Urban Living** (3) George
Development of recreational skills; emphasis on local opportunities

for recreational activities. Current trends in urban recreational development and program planning. May be repeated for credit with permission of instructor. (Fall and spring)

157 **Dance Technique Theory** (3) Staff
Theoretical foundations of dance. Applied principles of kinesiology analysis and practice of contemporary dance techniques. (Fall)

158 **Safety: Prevention, and Care of Sports Injuries** (3) Georg
(Formerly Safety Education)
Safety education, liability, prevention and care of sports injuries; related personnel, facilities, and equipment.

164 **Physiology of Exercise** (3) Paup
The physiological functions of the body and the effect of exercise on these functions. Prerequisite: HKLS 150 or permission of instructor. (Fall)

171 **Current Professional Literature and Competencies** (3) Snodgrass
(Formerly Current Professional Literature)
Study of current literature with implications for physical education; use of library resources and retrieval systems; evaluation of professional competencies. Prerequisite: HKLS 103. (Fall or spring)

172 **International Experiences** (1 to 6) Staff
Travel to a foreign country for study of a specific topic.

173 **Independent Study** (1 to 3) Staff
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of adviser and instructor. May be repeated for credit. (Fall and spring)

175 **Seminar in Music and Dance** (3) Staff
Rhythmic analyses: resources in music and accompaniment principles for dance. Prerequisite: basic knowledge of rhythmic theory. (Spring, even years)

184 **Workshop in Human Kinetics and Leisure Studies** (1 to 3) Staff
May be repeated for credit with permission of advisor.

Third Group

200 **Experimental Course** (1 to 3) Staff
Courses offered for the first or second time. May be repeated for credit with the approval of the advisor.

202 **Conceptual Basis of Motor Learning** (3) Stalling
Variables of perceptual motor learning and performance; theories, concepts, and models of learning related to the development of motor skills. (Fall and spring)

205 **Perceptual-Motor Problems: Diagnostic-Therapeutic Techniques** (3) Stalling
(Formerly Diagnostic-Prescriptive Techniques: Perceptual-Motor Domain)
Programs of perceptual-motor development and their theoretical assumptions; diagnostic and remediation techniques. (Spring)

230 **Movement Analysis of the Young Child** (3) Snodgrass
(Formerly Movement Analysis)
Analysis of fundamental movement in the child from birth to age eight, and implications for learning experiences; study and practice in techniques of critical observance of motor behavior. (Spring)

232 **Current Issues in Elementary School Physical Education** (3) Snodgrass
Current philosophy, trends, and research; implications for curriculum, instruction, evaluation. (Spring)

239 **Urban Recreation for Special Populations** (3) Staff
Development of recreation for the disabled, impaired, and handicapped using the Baltimore-Washington areas as the urban problem setting; development of competencies in community organization, communications, consultation, group dynamics, and interpersonal relations; program development and evaluation. (Fall)

240 **Physical Education for the Handicapped** (3) Songster
Adaptive physical education for handicapped populations; development of competencies in diagnostic-prescriptive teaching, program design and evaluation, consultation, and communications. (Fall)

244 **Therapeutic Recreation Practice** (3) Staff
Professional competencies for delivery of services to the handicapped, disabled, impaired; public and private setting for service delivery; client assessment and counseling techniques; basic special education, medical, and rehabilitation terminology; etiology of handicapping conditions as related to recreation. (Spring)

245 **Medical Aspects of Therapeutic Recreation and Adaptive Physical Education** (3) Hawkins
Etiology, symptomology, and treatment of chronic and traumatic disorders associated with handicapping conditions; implications for programming, facility development, and related aspects of therapeutic recreation or adaptive physical education. (Spring)

250 **Administration of Tourism Services** (3) Shafer
(Formerly Administration of Leisure and Tourism Services)
Planning and organization of a comprehensive system of tourism services utilizing educational, cultural and recreational resources; emphasis on public relations, personnel administration and supervision, cost-benefit analysis, fiscal management and managerial accountability. (Spring)

251 **Leisure Counseling** (3) Staff
The application of counseling techniques to leisure service in order to provide recreators the ability to help people make choices of leisure experiences. (Spring)

252 **Supervision of Leisure Services** (3) Staff
(Formerly Supervision of Leisure Studies)
Solving problems in supervision of leisure programs, including work distribution, scheduling, recruitment, training and personnel evaluation. (Fall)

256 **Sports Medicine and Rehabilitation** (3) Staff

Theory and practice of therapeutic exercise and recreation as applied to the rehabilitation of the handicapped: injuries; preventive, adaptive, and remedial concepts; research in area of general rehabilitation practice; professional roles as related to ancillary medical focus. (Spring)

260 **Tourism Development** (3) Hawkins

Theoretical and practical framework for evaluating development models using case studies which highlight existing organizational structures, decision-making systems and implementation procedures. (Fall)

261 **Planning for Tourism** (3) Anzola-Betancourt

Integrated planning for tourism organizations, financing and physical development for comprehensive tourism projects; consideration of basic concepts, approaches, and models. (Fall)

265 **Sports and Politics** (3) Breen

Methods of political analysis applied to sports policy; comparative approach to the study of the relationships between ideology, economic development, and the types and levels of government involvement in sports policy. (Spring)

270 **Philosophic Foundations of Dance** (3) Staff

Examination and discussion of problems in dance confronting the artist, as well as the audience, in terms of dance as an art form and the creation and experience of that form.

271 **Dance Notation and Reconstruction** (3) Katz

Recreating the structure and dynamics of movement from Labonotated dance scores; exploration of floor work; some emphases in writing skills leading to elementary or intermediate certification. Prerequisite: HKLS 137. (Fall)

273 **Advanced Choreography** (3) Staff

Advanced choreographing of group or solo dance work. Course work includes responsibility for auditions, rehearsals, and final work presented in concert. May be repeated once for credit. (Fall or spring)

276 **Dance in Society** (3) Johnson

Anthropological aspects of dance; emphasis on current research and literature.

280 **Advanced Workshop** (1 to 3) Staff

Workshops in physical education, dance, and recreation. Emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor.

282 **International Experiences** (1 to 9) Staff

May be repeated for credit with approval of advisor.

283 **Practicum** (3 to 6) Staff

(Formerly Supervised Experience)

Field work, internship and/or instructional practice, including con-

ference and/or seminar. May be repeated once for credit with permission of advisor. (Fall and spring)

290 Advanced Seminar (1 to 3) **Staff**
May be repeated for credit with approval of advisor.

293 Independent Study (1 to 6) **Staff**
May be repeated for credit with approval of advisor.

296 A Systems Analysis of Tourism Services (3) **Shafer**
(Formerly A Systems Approach to Leisure and Tourism Resource Development)
Comprehensive planning, human resource development, and program facility design, using systems approaches. (Spring)

297 Advanced Topical Studies (3 or 6) **Staff**
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. May be repeated once for credit with permission of the advisor. (Fall and spring)

299 Thesis Research (6) **Staff**

INSTITUTE FOR SINO-SOVIET STUDIES

Members of the Institute

C. Sigur *(Director)*, C.F. Elliott, A. Gyorgy, H.C. Hinton, W.R. Johnson, C. Kim, C.A. Linden, G.A. Olkhovsky, V. Petrov, C. Shih, R.B. Thompson, S. Thornton, R.Y. Yin

Associate Members of the Institute

J. Baclawski, E.M. Hadley, A. Halpern, J. Hardt, T. Hsia, B. Ramundo, D. True, R.K. White, T.W. Wolfe

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The Institute for Sino-Soviet Studies offers specialized graduate study in the School of Public and International Affairs. Students who lack background in Soviet and East Asian studies are required to take undergraduate courses selected by the advisor as prerequisite to graduate work. Related preparatory undergraduate courses include the following: Econ 101, 102, 133, 134, 169, 170; Hist 137, 138, 143, 144, 145, 146, 187, 188, 189, 195-96; PSc 1, 9, 106, 107, 108, 161, 165, 168, 170, 73; Psyc 151.

For description of the objectives and programs of the Institute, see pages 176–

For description of the courses listed below, see the appropriate departmental listing.

ECONOMICS

267 Seminar: Soviet Economy (3) Hardt
268 Seminar: Economic Theory and Development in Communist Countries (3) Hardt
269 Economy of Communist China I (3) Yin

270 *Economy of Communist China II* (3) Yin
271 *Economy of Japan* (3) Hadley

GEOGRAPHY AND REGIONAL SCIENCE

265 *Seminar: Geography of the Soviet Union* (3) Baclawski
266 *Seminar: Geography of China* (3) Trus

HISTORY

205 *Evolution of Nationalism in Eastern Europe* (3) Petrov
206 *Revolution in Eastern Europe* (3) Petrov
207 *Seminar: the Communist Party of the Soviet Union* (3) Staff
208 *U.S.-Soviet Relations Since World War II* (3) Thornton
*213 *Comparative Communist Systems I* (3) Petrov
*214 *Comparative Communist Systems II* (3) Hinton
215 *Transformation of the Socialist Commonwealth* (3) Petrov
217–18 *Seminar: Russian and Soviet Thought* (3–3) Staff
237 *Seminar: Soviet Foreign Policy, 1917-1960* (3) Petrov
245 *Studies in Revolutionary History* (3) Thompson
246 *Research Seminar: Russian History* (3) Thompson
288 *Research Seminar: History of Chinese Communism* (3) Thornton
289 *Seminar: Modern Japanese History* (3) Sigur
295–96 *Research Seminar: the Modern Far East* (3–3) Johnson
345–46 *Readings in Russian History* (3–3) Thompson
387–88 *Readings in the History of Sino-Soviet Relations* (3–3) Thornton
395–96 *Readings in Modern Far Eastern History* (3–3) Johnson

†LAW

546 *Soviet Law* (2) Ramundo
547 *Chinese Law* (2) Hsia

POLITICAL SCIENCE

207 *Readings in Socialism and Communism* (3) Elliott, Linder
208 *Readings in Marxism and Leninism* (3) Elliott, Linder
230 *Comparative Government and Politics I* (3) Kim, Starrels, McClintock
231 *Comparative Government and Politics II* (3) Kim, Starrels, McClintock
*232 *Comparative Communist Systems I* (3) Staff
*233 *Comparative Communist Systems II* (3) Staff

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* An interdepartmental course offered by the History and Political Science Departments.
† Students who elect courses in law must have the permission of the Dean of the National Law Center. For course descriptions, see the *National Law Center Bulletin*.

251	*Principles and Problems of International Political Communication* (3)	Staff
264	*Political and Social Institutions of Eastern Europe* (3)	Gyorgy
265	*Government and Politics of Eastern Europe* (3)	Gyorgy
266	*Readings in Soviet Government and Politics* (3)	Elliott, Linden
267	*Soviet Government and Politics* (3)	Elliott, Linden
268	*Soviet Foreign Policy* (3)	Elliott
269	*Soviet Military Policy and Strategy* (3)	Wolfe
270	*Politics of Mainland China I* (3)	Hinton
271	*Politics of Mainland China II* (3)	Hinton
272	*Foreign Policy of Mainland China* (3)	Hinton
275	*International Policy of the Far East* (3)	Hinton
276	*Government and Politics of Japan and Korea* (3)	Staff
291	*Colloquium: East Asia* (3)	Staff
292	*Colloquium: Russia and Eastern Europe* (3)	Gyorgy

PSYCHOLOGY

259	*Seminar: Psychology of Communism* (3)	White

INTERNATIONAL AFFAIRS

See **Public and International Affairs.**

INTERNATIONAL RELATIONS—DOCTORAL STUDY

Doctoral Program Committee in International Relations

E.M. Sapin *(Chairman)*, R.M. Dunn, Jr., A. Gyorgy, W.R. Johnson, B. Nimer, S. Reich, H.M. Sachar

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Doctor of Philosophy in the field of International Relations. (The School of Public and International Affairs offers a Master of Arts degree program in the area of international affairs.) The program is directed by a committee whose members are drawn from the Economics, Political Science, and History Departments.

Required: the general requirements, pages 89–91, 97–99. Each program must include three disciplines and five fields of study. However, in some cases, cohesive and well-integrated programs based on two disciplines may be approved. Specific program guidelines are available from the Graduate School on request.

ITALIAN

See **Romance Languages and Literatures.**

JAPANESE

See **East Asian Languages and Literatures.**

JOURNALISM

Professorial Lecturers F.L. Dennis, H.L. Coppenbarger, H.E. Paine, G. Cheely, P. Silberman, C.W. Puffenbarger
Associate Professors R.C. Willson, P. Robbins *(Chairman)*
Associate Professorial Lecturers O.L. Mazzatenta, D.W. Burkett, R.L. Courage, J.P. McGill, E. Rogers, N.T. Gregg, J. Coldsmith
Assistant Professorial Lecturers T.W. Zito, Jr., J.G. Glover, W.R. Fonda

Bachelor of Arts with a major in Journalism (Departmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 73–74, 80–86. **(Students** planning to major in journalism should take Engl 11 rather than Engl 12 **satisfying the English composition requirement.)**
2. Prerequisite courses—Engl 51–52 or 71–72; Jour 71–72; PSc 1 and 2 or 2 and 3.
3. **Required courses in the major—24 hours of second-group courses in** Journalism, including (a) Jour 111, 196, 198; and (b) nine semester hours chosen from Jour 121, 125, 133, 135, 137, 138, 139, 151, 155.
4. **Required as a minor area of concentration—a minimum of 18 semester** hours of second-group courses, chosen in consultation with the major adviser in one other department or field of study in Columbian College of Arts and Sciences.

Recommended Electives: Econ 121, 142, 161, 162, 181–82; PSc 111, 112, 114–15, 116, 118, 119, 120; Psyc 115; SpDr 133, 134, 135–36; Stat 53.

Departmental prerequisite: Jour 111 is prerequisite to Jour 125, 133, 135, 137, 138, 139, 190 and 196.

First Group

71–72 **Introduction to Mass Communication** (3–3) Willson

Jour 71: evolution of newspapers and other media in relation to political, social, and economic life; concept of press freedom. Jour 72: mass media, problems of contemporary journalism, emphasis on federal government-media relations. **(Academic year)**

Second Group

111 Reporting (3) Robbins

Gathering, evaluating, and writing news. Some typing required. Laboratory fee, $5. **(Fall and spring)**

115 Newspaper Editing and Make-up (3) Coppenbarger, Coldsmith

Preparation of news copy, pictures, and other graphic material for publication; evaluation of news; page layouts; newspaper make-up. **(Fall and spring)**

116 **Magazine Layout and Design** (3) Paine
Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry. (Fall)

117 **Magazine Editing** (3)
The editor's responsibility to publisher and readers. Setting the editorial goals and planning content and production to meet them. Editing copy for general and specialized magazines.

121 **Feature Writing** (3) Willson
Free-lancing nonfiction articles, materials obtained through independent investigation. (Fall and spring)

125 **Science Writing** (3) Burkett
Writing science news for the mass media. (Spring)

133 **Advanced Reporting: Community News** (3) Puffenbarger
Coverage and writing of local news. (Fall)

135 **Advanced Reporting: Consumer Affairs** (3) Staff
Specialized training in the consumer news field. (Fall)

137 **Advanced Reporting: National Affairs** (3) Silberman
Coverage and writing of federal government news. (Fall)

138 **Investigative Reporting** (3) Puffenbarger
In-depth reporting in selected areas of political, economic, and social affairs. (Spring)

139 **Advanced Reporting: Radio and Television News** (3) Cheely
Preparing news and public affairs programs for broadcast media. (Spring)

140 **Photojournalism** (3) Fonda, Gregg
Taking and processing photographs for publication, picture selection, cropping, captions. Students must purchase their own film and print paper. Laboratory fee, $25. Students who received credit for Art 23 or 24 cannot receive credit for Jour 140. (Fall and spring)

141 **Intermediate Photojournalism** (3) Mazzatenta
(Formerly Advanced Photojournalism)
Advanced news and feature photography, editing, layout and photo essays. Students must purchase their own film and print paper. Laboratory fee, $25. Prerequisite: Jour 140 or Art 23 24. (Spring)

142 **Advanced Photojournalism** (3) Rogers
(Formerly Special Projects in Photojournalism)
Individual projects in picture stories and photo essays in black and white or color; emphasis on layout, captions, text. Students must purchase own film and print paper. Laboratory fee, $25. Admission by permission of instructor.

145 **Principles and Problems of Public Relations** (3) McGill
Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public

institutions. Case histories of successful programs. (Fall and spring)

146 **Government Information** (3) Courage
Growth of information activities in government and the role of the information specialist. Writing and editing for government information operations. (Spring)

150 **News Coverage in Washington** (3) Willson
The Washington news beats, channels and sources of news in the nation's capital, uses and abuses of the media. Field trips to local news centers and press briefings. Guest lecturers from the Washington press corps.

151 **Editorial Writing** (3) Robbins
Techniques of editorial writing, conducting the editorial page, function of editorials and columns of news commentary in a free press. (Spring)

155 **Critical Writing and Reviewing** (3) Zito, Glover
Reviewing and commenting on the arts and entertainment for the mass media. (Fall)

160 **The New Journalism** (3) Robbins
A survey of the impact of fiction techniques on modern nonfiction reportage. Study of selected writers to identify influences and trends.

170 **News Publication Management** (3) Coldsmith
The business side of publishing. Study of the roles of advertising, circulation, promotion, accounting and administration, and mechanical departments in newspapers and other publications. (Spring)

190 **Internship in Journalism** (3)
Study of a journalistic medium in action by assignment to a Washington area news office. Admission restricted to senior journalism majors selected by a departmental committee. (Fall and spring)

*195 **Documentary Photography** (3) Lake and Staff
Social problems, team-taught. Each student will work on projects with social dimensions. Laboratory fee, $25. Admission by permission of instructor. Limited enrollment. (Spring)

196 **Senior Project** (3) Staff
Open only to journalism majors. Major journalistic effort undertaken in consultation with a member of the journalism staff. A written request describing the project must be presented to the staff member for approval, and filed with the student's advisor in the semester before registration. (Fall and spring)

198 **Law of the Press** (3) Dennis
Freedom of the press, censorship, legislative controls, publication in contempt of court, copyright, newsgathering agencies, labor law and the newspaper business, law of libel, privileged matter, fair comment on public characters, right of privacy. (Fall)

* Interdepartmental course offered by the Departments of Journalism and Art.

JUDAIC STUDIES

Committee on Judaic Studies

D.A. Altshuler *(Chairman)*, R.H. Davison, R.G. Jones, T.Z. Lavine, B. Nimer, B. Reich, H.M. Sachar, J.E. Ziolkowski

Columbian College of Arts and Sciences offers an interdisciplinary program in Judaic Studies leading to the degree of Bachelor of Arts. This program is intended for students who wish to investigate the history, language, literature, religious and philosophical thought, and political and social experience of the Jewish people from the perspective of several academic disciplines. (Students who wish to concentrate on the religious aspects of Judaism and its relationship to the other religious traditions of the world may prefer to elect a major in religion with an emphasis on Judaism [see page 439].)

Bachelor of Arts with a major in Judaic Studies (Interdepartmental) The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses—Clas 21–22, 23–24; Rel 9, 23.
3. Required courses for the major (30 semester hours):
   (a) Clas 103 or 104; Hist 158; PSc 179; Rel 113–14 or 115–16, 213 or 238.
   (b) two meaningfully related courses selected from each of two of the following groups: I—Anth 177, 183; Art 111, 112; II—Hist 108, 109, 110, 113, 114, 121, 122, 123, 124, 139, 140, 171, 172, 193, 194, 292, 293, 294; III—Phil 111, 112, 126, 127, 131, 172; IV—PSc 177, 178; V—Rel 103, 104, 105, 107, 111, 122, 126, 137, 139, 144, 145, 146, 161, 162, 172, 174, 181, 184, 291, 292.

Students applying for the 90-hour degree program in Judaic Studies must, in addition to meeting the general requirements (see page 82), present evidence of exceptional preparation in the field of Judaism, provide strong recommendations from high school teachers and or counselors, and complete a satisfactory interview with the Committee on Judaic Studies.

LATIN AMERICAN STUDIES

Committee on Latin American Studies

M. Gordon *(Chairman)*, F. Belaunde-Terry, T.F. Carroll, J. Grunwald, R.L. Humphrey, Jr., P.F. Klarén, J.W. Robb, F.R. Siegel, G. Stuart, C. McClintock, F. Thoumi

Bachelor of Arts with a major in Latin American Studies (Interdepartmental) The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses—Anth 2, Econ 1–2, PSc 1 or 3.
3. Required courses in related areas—Span 1–2, 3–4; or equivalent. (Span 9–10 or equivalent is recommended.)
4. Required courses in the major—(a) Anth 172, 184, or 185; Econ 185; Geog 161; Hist 163–64; PSc 183, 184; and six semester hours chosen from Span 151–52, 155–56, 157–58, or other approved courses; (b) 18 semester hours, including an interdisciplinary seminar (287) in one of the following areas: anthropology, economics, geography and regional science, Hispanic literatures, history or political science. The required courses listed in (a) which are in the selected area may be included in computing the required 18 semester hours for (b).

Master of Arts in the field of Latin American Studies—See the School of Public and International Affairs, pages 160–77.

Candidates for the degree of Doctor of Philosophy may elect Latin American history as an area of specialization in the field of history, Spanish American literature as an area of specialization in the field of Romance Languages and Literatures, or politics of Latin America as an area of specialization in the field of political science.

Courses Dealing with Latin America:

Anthropology—170, 172, 184, 185 262, 268, 272, 282, 287
Economics—185, 233, 234, 251–52, 285, 286, 287
Geography and Regional Science—127, 161, 261, 287
History—161, 163–64, 165, 166, 261–62, 287, 361–62
Political Science—183, 184, 283, 284, 285
Portuguese—31–32
Spanish—91–92, 151–52, 155–56, 157–58, 197–98, 253, 255, 256, 261, 264, 266, 287

LATIN

See **Classics.**

MANAGEMENT SCIENCE

Professors R.F. Ericson, G.L. Lippitt, P.B. Vaill, J. Harvey
Professorial Lecturers T. O'Connor, G.B.M. Hopper, R.H. Walther, W.A. Ward, J.F. Coates
Associate Professors J.F. McCarthy, Jr. *(Chairman)*, T.E. Shaughnessy, R.L. Holland, E.K. Winslow, W.E. Smith, W.W. Hardgrave, E.B. Adams, J.P. Coyne
Adjunct Associate Professors H.C. Demoody, J. Lobuts, Jr.
Assistant Professors E.H. Forman, B. Dawson, S. Umpleby

Programs of study leading to the degrees of Bachelor of Business Administration, Master of Business Administration, Doctor of Business Administration and Doctor of Public Administration are offered by the School of Government and Business Administration (see pages 127–59).

Second Group

118 **Introduction to Information Processing** (3) Smith, Coyne, Forman

Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve flow charting and computer programming in a higher level language (FORTRAN) and are run on the SCBA computer with the School's computer terminals. Laboratory fee, $25. (Fall and spring)

119 **Computer Programming for Information Systems** (3) Smith

COBOL programming for business and government data processing applications. For students already familiar with basic computer concepts, flow charting, and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 118 or Stat 97. Laboratory fee, $25. (Fall and spring)

120 **Information Systems Development I** (3) Coyne, Smith, Demoody

Assessment of the systems concept and its relationship to organizational information decision-making and management. Concepts and techniques involved in the initial development of new or revised computer-based information systems, e.g., systems analysis and design phases. Prerequisite: Mgt 118, 119; or permission of instructor. Laboratory fee, $25. (Fall)

121 **Information Systems Development II** (3) Coyne, Smith, Demoody

A further examination of the information systems development process, including concepts and techniques for assessment, selection, introduction, operation, and maintenance of a newly designed automated information system. Prerequisite: Mgt 120 or permission of instructor. Laboratory fee, $25. (Spring)

122 **Special Studies in Information Systems** (3) Coyne, Smith, Demoody

An independent or group-study project in information systems development which may involve faculty-supervised research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Prerequisite: Mgt 121 or permission of instructor. (Fall and spring)

Third Group

201 **Advanced Administrative Management** (3) Adams, Ericson, Eastin, Brown, Page, Roman, Loeser

Integrative approach to organization and management concepts, philosophy and theory as applied to all types of agencies and institutions. Evolution of management thought, functions, and practices in various organizational contexts. Contemporary issues confronting the manager. (Fall and spring)

203 **Mathematics for Management** (3) Hardgrave, O'Connor

Mathematical concepts employed in the solution of management problems. Applications of analytical geometry, functions, elements of calculus, and linear algebra to optimization problems. Prerequisite: knowledge of algebra. (Fall and spring)

204 **Quantitative Factors in Administration** (3) Hardgrave, Dawson, Forman

Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application. Breakeven analysis, linear programming, probability, decision-making under uncertainty, queuing models, inventory models. (Fall and spring)

207 **Human Behavior in Organizations** (3) Lippitt, Winslow, Harvey, Vail.

Individual, group, intergroup, and other human behavior and development; application of behavioral science research to administration. Learning exercises and practical applications emphasized. Prerequisite: Mgt 201. (Fall and spring)

208 **Current Issues in Organizational Behavior** (3) Winslow

Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and similar problems. Problems in behavioral science research. Prerequisite: Mgt 207. (Fall and spring)

210 **Behavioral Factors in the Process of Change** (3) Harvey, Winslow

Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply their learning in various settings and to demonstrate competence in various media. This course emphasizes the relationship between theory and practice. Prerequisite: Mgt 207 or permission of instructor. (Fall and spring)

212 **Organizational Development: Concepts and Methods** (3) Lippitt, Harvey, Vaill

Primarily for doctoral students. Examination of different concepts of organizational structure, processes, and growth. Models of organizational change will be developed with a taxonomy of methods of initiating action to further organizational development. The methods of action, research, team building, confrontation meetings, objectives analysis, job restructuring, and other interventions will be related to organizational development processes. Prerequisite: Mgt 207, 210, or equivalent. (Fall)

213 **Consultative Processes in Organizations** (3) Lippitt, Harvey

Primarily for doctoral students. Examination through actual practice as well as theory of the nature of the helping process between one person or group and another person or group. Dynamics of the consulting process will be explored as well as role differences in internal and external consultation. Development of skill in the helping relationship will be furthered within the framework of interpersonal relation concepts and laboratory experiences. Prerequisite: Mgt 207, 210; or equivalent. (Spring)

225 **Managerial Statistics I** (3) Hardgrave, Dawson, Forman

Mathematics of probability and statistics and application to management science and operations research. Topics include sample spaces, probability models and random variables, discrete and continuous probability distributions, moments and other descriptive measures, sampling theory and practice, and point and interval estimation. Prerequisite: Mgt 203 or equivalent. (Fall and spring)

226 **Managerial Statistics II** (3) Hardgrave, Dawson, Forman

Applications of the theory and techniques of mathematical statistics. Topics include hypothesis testing, nonparametric methods, analysis of variance, introduction to statistical decision theory. Prerequisite: Mgt 225. Laboratory fee, $10. (Fall and spring)

227 **Mathematical Programming: Techniques and Applications** (3) Hardgrave, Dawson, Forman

Technical and applied considerations of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of applications of linear programming. Introduction to integer programming, algorithms, and formulations. Prerequisite: Mgt 203 or equivalent. Laboratory fee, $10. (Fall)

228 **Techniques of Operations Research** (3) Hardgrave, Dawson, Forman

Survey and introduction to contemporary operations research techniques, including nonlinear programming, dynamic programming, inventory and queuing models and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 225, 227. (Spring)

229 **Seminar: Management Sciences and Operations Research** (3) Hardgrave

Supervised in depth study and advanced projects in applied operations research. Prerequisite: Mgt 228 or permission of instructor. (Spring)

240 **Survey of Information Technology** (3) Adams, McCarthy, Demoody

Management oriented survey of key areas in information technology. Includes hardware configurations, processing procedures and new developments; software languages, capabilities, procedures and interactive programming; systems technology, analysis, and design; systems concepts, modeling and simulation impact on the organization; EDP management areas, equipment upgrading; replacement and acquisition; personnel practices, budgeting and costing procedures, security of the facility; legislative and social issues, Freedom of Information Act, Family Educational Rights and Privacy Act of 1974; employment patterns, professionalization, shifts in power and value systems. Laboratory fee, $25. (Fall and spring)

241 **Management Information Systems Development and Application** (3) McCarthy

Contemporary theories and practices in the development of management information systems. Participation in the design of information systems specifications. The roles of both management and systems design personnel in the systems development process studied and evaluated. Impact of management information systems upon the organization and its decision-making processes evaluated. Case studies. Prerequisite: an introductory course in information technology, or permission of instructor. (Fall and spring)

242 **Comparative Computer Systems** (3) Coyne

Characteristics and capacities of the range of information processing equipment in use today. Recent and prospective equipment and software development. Selection of computers and related software and equipment. Prerequisite: Mgt 241 or permission of instructor. (Spring)

243 **Management of Information Technology** (3) Adams

Advanced course; emphasis on principles, practices, and trends in the management of information technology. Topics include the role and control of an information processing installation; trends, new hardware, and advanced technology in the computing milieu and their implications for information processing management; an analysis of the performance of the data processing activity internally and externally, according to developed criteria. Case studies. Prerequisite: Mgt 241, 242; or permission of instructor. (Fall)

244 **Information Systems and Telecommunication** (3) Coyne, Forman, Smith

Principles of telecommunications; the applications of telecommunications for the transmission of data between computers, between humans, between humans and computers. The use of the technology of data communications to enhance the flow of information for management purposes within an organization. Telecommunications terminology, hardware and software considerations, legal and policy issues, recent developments, and calculations necessary for the specification and design of telecommunications systems. Laboratory fee $25. (Fall)

245 **Data Base Management** (3) Smith, Coyne

An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective data base system. Topics include data base organization, creation, and maintenance; effort and economic justification; evaluation criteria; standardization of data base systems; impact of packaged data management systems; and an analysis of the current state-of-the-art in data base development. Students will become proficient in the use of an actual data base management system. Prerequisite: Mgt 119, 241. Laboratory fee, $25. (Spring)

249 **Seminar: Information Technology** (3) Adams, McCarthy

Current problems in the design and implementation of computer-supported systems; emphasis on current state-of-the-art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 241, 242, 243; or permission of instructor. (Fall and spring)

260 **Introduction to General Systems and Cybernetics** (3) Ericson, Adams, Umpleby

Analysis of fundamental general systems concepts and cybernetic theories evolving in various branches of knowledge and academic disciplines, emphasizing their transcontextual and interdisciplinary nature. Systems approach and general systems frame of reference compared and contrasted. Essential characteristics of and requirements for creation and maintenance of viable systems.

261 **Fundamentals of General Management System and Organizational Cybernetics (GEMSOC)** (3) Ericson, Adams, Umpleby

Dynamics of organization and management from a general systems and cybernetics viewpoint. GEMSOC potential for integrating apparently disparate aspects of organization and management research and theory. Translation of GEMSOC research and theory into the world of organizational behavior and management practice. Prerequisite: Mgt 260.

263 **Case Studies and Field Research in GEMSOC** (3) Ericson, Adams, Umpleby

Investigations of existing organizational structures and ongoing management processes from a systems and cybernetics viewpoint. Operational evaluations of firms and agencies, including intercontextual comparative studies. Assessments of need for better tools of analysis and synthesis. Prerequisite: Mgt 261

264 **Organizational Dynamics Simulation and Metasystemic Modeling** (3) Ericson, Adams, Umpleby

Literature review and current practice analysis. Operation research and conventional modeling techniques, including iconic, analog, and symbolic. Computerized organization dynamics simulation as a management tool. Institutional structure simulation and metasystemic modeling developed by students. Evaluation of organization dynamics modeling and the state of the science and art of computer simulation. Problems and prospects. Prerequisite: Mgt 261.

265 **Research Seminar in GEMSOC Theory** (3) Ericson, Adams, Umpleby

For doctoral students only. Advances in theoretical bases of general systems management and organizational cybernetics. Investigations into sources of GEMSOC concepts in literature of traditional fields. Evaluation of related synthetic and hybrid disciplines, such as bionics. Extensions of existing theory into new areas, such as managerial axiology. Prerequisite: Mgt 261

266 **Philosophic and Policy Issues in Institutional Articulation** (3) Ericson

Need for greater institutional coherence of managerial decision-making in an "only one world" frame of reference. Systemic articulation and metasystemic planning: the deliberate evolution of more effective institutional forms. Desiderata for responsive institutional structures, from a general human systems view point. Reconciliation of organizational human participant value conflicts as a general management systems problem. Institutional sovereignty, organizational morality, and human values: the search for systemic optimality.

290 **Special Topics in Management Science** (3) Staff

Experimental offering, new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Research Methods** (3) Staff

Research techniques, sources of information, array and analysis of data, interpretation and presentation of the findings. (Fall and spring)

298 **Directed Readings and Research in Management Science** (3) Staff

(Fall and spring)

299 **Thesis Seminar** (3) Staff

(Fall and spring)

300 **Thesis Research** (3) Staff

(Fall and spring)

Fourth Group

390 **Philosophical Foundations of Administrative Research** (3) Lauter
Philosophy of science as applied to research in administration. Topics include the nature and current problems of epistemology, the development and role of theories, and the relationship between theory, methodology and empirical data. (Fall and spring)

391 **Methodological Foundations of Administrative Research** (3) Lauter
Examination of the process of social science research. Use of models and theoretical frameworks in research; formulation of research questions, hypotheses, operational definitions, research design, sampling methods, and data analysis approaches. Primary emphasis on the development of dissertation proposals. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral students preparing for the general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

MATHEMATICS

Professors D. Nelson, T.P.G. Liverman *(Chairman)*, H. Kenyon, C. Taam, R.L.A. Bari, I. Katz
Professorial Lecturers D.M. Dribin, A. Thaler
Associate Professors W.A. Smith, D.R.K. Henney, I.I. Glick, M.D. Green, M.P. Lee, H.D. Junghenn, E.A. Stone
Associate Professorial Lecturers S.L. Brodsky, M.E.I. Morris
Assistant Professorial Lecturers P.L. Hayes, W. Altman, B.F. Rice

Bachelor of Arts or Bachelor of Science with a major in Mathematics (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 106, 121, 123, 139 and 140. It is also strongly recommended that students take French, German, or Russian, and mathematically related courses in such subjects as physics, statistics, economics and engineering.

Bachelor of Arts or Bachelor of Science with a major in Applied Mathematics (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in related areas:
   (a) Stat 189–90.
   (b) Eighteen semester hours to be selected, in consultation with the advisor, from the following areas of application. At least 12 semester hours must be chosen from one area, and the other six semester hours must be chosen from courses numbered 101 or higher. For courses in applied science, civil

engineering, electrical engineering and computer science, engineering administration, mechanical engineering, and operations research, see the *School of* **Engineering and Applied Science Bulletin**.

Area I. Social and management sciences—courses chosen from ApSc 115, CE 183, 197; Econ 1 2, 101, 102, 123, 199; EAd 261, 269, 281–82, 283, 284, EE 184, 283, 284, 285; Math 101, 102, 113, 124; OR 201, 209, 251, 252, 261, 277, 279, 281, **291; Stat 110, 117, 118, 131, 157–58, 159, 161–62, 165–66, 188, 197**

Area II. Engineering and physical sciences—courses chosen from Chem 111 12, 113 14; CE 120, 123, 140, 166, 167, 168, 185, 190, 191, 192, 193, 198, 201, 202, 203, 204, 205, 206, 207, 210, 220, 223, 252, 254, 258, 261, 262 263, 275; Stat 117, 118, 131, 157 58, 159, 161 62, 197; and any course offering in electrical engineering and computer science, mechanical engineering, or physics

Area III. Computer sciences—courses chosen from EE 152, 153, 154, 157, 158; Math 101, 113, 124, 142, 153, 154, 157; Stat 110, 157 58, 161 62, 165 66, 197.

4. Required courses in the major—a minimum of 24 semester hours of second group courses in mathematics, including Math 111, 112, 139, 140, 181 82. It is also strongly recommended that students take French, German, or Russian.

Master of Arts in the field of Mathematics—Prerequisite: a bachelor's degree with a major in mathematics from this University, or an equivalent degree.

Required: the general requirements, pages 89–97. Students must complete 30 semester hours of approved course work with or without a thesis.

Master of Arts or Master of Science in the field of Applied Mathematics—Prerequisite: a bachelor's degree with a major in mathematics or a related field **such as statistics, a physical science, engineering, or economics**.

Required: the general requirements, pages 89–97. Course work is divided between mathematics courses and courses from one area of application—economics, engineering (civil, computer science, electrical, engineering administration, mechanical, or operations research), physics, statistics, or urban and regional planning. Courses in the chosen area of application are selected in **consultation with the relevant department**.

Candidates for the degree of Master of Arts must complete 30 semester hours of approved course work, including Math 299 300 *Thesis Research*. At least 15 semester hours must be in mathematics courses, with no more than three of these from second-group courses. The remaining courses are chosen from the selected area of application. Theses are jointly supervised by the department of mathematics and the department concerned with the area of application.

Candidates for the degree of Master of Science must complete 30 semester **hours of course work; at least 15 of these must be in mathematics courses, with no** more than six semester hours from second group courses. There is no **thesis requirement.**

Master of Science for Teachers—Prerequisite: A bachelor's degree; at least 12 semester hours or equivalent in mathematics courses, including the equivalent of Math 31, experience in teaching mathematics at the secondary school level.

Required: 30 semester hours of approved second- or third-group mathematics **courses, including Math 168**.

Doctor of *Philosophy in the field of Mathematics*—Required: the general requirements, pages 89–91, 97–99. The department doctoral program committee, after consultation with the student, will stipulate (1) courses which must be taken to fulfill the 48-semester-hour requirement leading to the General Examination; (2) the two languages, selected from French, German, or Russian, which must satisfy the foreign language requirement; and (3) the four areas of study in which the student must prepare for the General Examination. The **doctoral program committee will appoint a Director of Research when the** student has selected (preferably early in the program) one of the following **research** fields for the dissertation: functional analysis (abstract differential

equations, functional equations, generalized functions, groups of operators), group representations, linear algebra (matrix theory), logic, measure and integration, ordinary and partial differential equations, theory of numbers, and topology (general topology, analytic topology, topological groups).

Bachelor of Arts in Education with a teaching field in Mathematics **Prerequisite: the education curriculum, pages 111–12.**

Required: the mathematics option and the professional courses listed on pages 115–16.

First Group

3 College Algebra (3) — Morris and Staff

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry. (Fall and spring)

6 Plane Trigonometry (3) — Morris and Staff

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor). (Fall and spring)

9 General Mathematics I (3) — Smith and Staff

For students electing Math 9 and 10 as a terminal sequence. Logic, sets, number systems. Prerequisite: two years of high school mathematics. (Fall and spring)

10 General Mathematics II (3) — Smith and Staff

Mathematical systems, geometry and introduction to statistics and probability. Prerequisite: Math 9. (Fall and spring)

30 Precalculus (3) — Bari and Staff

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring)

31 Calculus of One Variable (3) — Kenyon and Staff

Differentiation and integration of algebraic and elementary transcendental functions, with simple applications. Prerequisite: Math 30 or equivalent.* (Fall and spring)

32 Calculus of Several Variables (3) — Kenyon and Staff

Vectors, determinants, partial derivatives, multiple integrals, infinite series. Prerequisite: Math 31. (Fall and spring)

33 Calculus of Vector Functions (3) — Kenyon and Staff

Curves, Differential equations, infinite series, vector calculus, line integrals, Green and Stokes theorems. Prerequisite: Math 32. (Fall and spring)

41 Calculus for Economists I (4) — Junghenn

Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable.

* Math 30 may be waived as a prerequisite by examination on scheduled dates

optimization of one variable applied to economics. Prerequisite: Math 30 or equivalent.* (Fall)

42 Calculus for Economists II (4) Junghenn

Elementary linear algebra with economics applications, including input-output models; partial derivatives, multiple integrals; marginal analysis for functions of several variables, optimization of functions of several variables applied to economics, infinite series. Prerequisite: Math 41. (Spring)

†51 **Mathematics for the Social and Management Sciences I (3)** Glick and Staff

Notion of function, graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration. (Fall and spring)

†52 **Mathematics for the Social and Management Sciences II (3)** Glick and Staff

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra, determinants, rudiments of linear programming. Prerequisite: Math 51 or 53. (Fall and spring)

†53 **Mathematics for the Life, Social and Managerial Sciences I (4)** Liverman and Staff

Lecture (3 hours), laboratory (2 hours) Same topics as Math 51 with computer applications and introduction to Fortran programming. Computer work emphasizes motivation of basic mathematical concepts and applied problems in indicated areas for which mechanical computation is essential. New students must take a placement examination in algebra prior to registration. (Fall)

†54 **Mathematics for the Life, Social and Managerial Sciences II (4)** Liverman and Staff

Lecture (3 hours), laboratory (2 hours) Same topics as Math 52 with computer applications. Computer work emphasizes motivation of basic mathematical concepts and applied problems in indicated areas for which mechanical computation is essential. Prerequisite: Math 53. (Spring)

Second Group

101 Introduction to Mathematical Logic (3) Nelson

Introduction to proof theory and model theory of propositional and predicate calculi, computability, topics from foundations of mathematics. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor.

102 Axiomatic Set Theory (3) Nelson

Zermelo-Fraenkel set theory, ordinals and cardinals, foundations of the real number system. Prerequisite: Math 101 or permission of instructor.

* Math 30 may be waived as a prerequisite by examination on scheduled dates.
† Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52 or 53 and 54.

104 **Mathematics and Human Thought** (3) Dribin

Philosophical and historical aspects of mathematics and its interplay with other disciplines from antiquity to modern times. Prerequisite: two years of high school mathematics. (Spring)

106 **Introduction to Topology** (3) Kenyon

Prerequisite: Math 139 or permission of instructor. (Spring)

107 **Introduction to Algebraic Topology** (3) Bari

Prerequisite: Math 122 and 139, or permission of instructor. (Fall, even years)

111 **Mathematics for Engineers and Physicists I** (3) Henney and Staff

Linear differential equations, linear algebra, Fourier series and integral, nonlinear differential equations of the first order. Prerequisite: Math 32. (Fall)

112 **Mathematics for Engineers and Physicists II** (3) Henney and Staff

Ordinary differential equations, systems of differential equations, boundary-value problems, partial differential equations. Prerequisite: Math 111. (Spring)

113 **Graph Theory** (3) Bari

Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Prerequisite: Math 32.

121–22 **Introduction to Abstract Algebra** (3–3) Lee and Staff

Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

123 **Linear Algebra** (3) Lee and Staff

Theory of vector spaces, linear transformations, and matrices. Quadratic and bilinear forms, spectral decomposition. Prerequisite: Math 121. (Fall)

124 **Introduction to Matrix Theory** (3) Liverman

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors, Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Prerequisite: Math 32 or permission of instructor. (Fall and spring)

125 **Linear Programming** (3) Katz

Simplex algorithm, degeneracy, the assignment problem, duality theorems, post-optimality, the transportation problem, integer programming, applications. Prerequisite: Math 123 or 124, or equivalent. (Spring)

134 **Introduction to Boundary-value Problems** (3) Staff

Prerequisite: Math 111 or 142. (Spring, even years)

135 **Projective Geometry** (3) Dribin

Prerequisite: Math 123 or 124, or equivalent. (Fall, odd years)

139 Advanced Calculus I (3) **Taam**

Review and extension of elementary one-variable calculus, emphasis on the theoretical foundations; differential calculus of several variables. Prerequisite: Math 33. (Fall and spring)

140 Advanced Calculus II (3) **Taam**

Differential and integral calculus of several variables; contraction maps, implicit function and differential equation theorems. Prerequisite: Math 139 or equivalent. (Spring)

141 Advanced Calculus III (3) **Stone**

Tensors, differential forms, Stokes theorem, introductory differential geometry. Prerequisite: Math 140. (Fall)

142 Theory of Differential Equations (3) Liverman

Linear and some nonlinear differential equations. Topics include existence theorems, stability, control theory, limit cycles, and applications to physics and ecology. Prerequisite: Math 139 and 123 or 124, or permission of instructor. (Spring)

153 Introduction to Numerical Analysis (3) Brodsky

Introduction to fundamentals of numerical analysis using modern digital computers. Solution of linear systems and of ordinary differential equations. Interpolation polynomials. Iterative solution of nonlinear equations. Simple quadrature techniques. Prerequisite: Math 33 or equivalent. (Fall, even years)

154 Difference Equations (3) **Brodsky**

Introduction to finite difference equations and their solution. Physical examples and analogies with differential equations are employed to motivate and apply the techniques developed. Generating functions. Analysis of error and stability characteristics. Prerequisite: Math 111 or 139, or equivalent. (Spring, odd years)

157 Introduction to Complex Variable Theory (3) Henney and Staff

Prerequisite: Math 139. (Spring)

168 Seminar: Curriculum Studies (3) Bari and Staff

Open only to candidates for the degree of Master of Science for Teachers, teachers for in-service training or students recommended by the department of education. Critical examination of secondary school mathematics, curricula, techniques and programs. Prerequisite: Math 31 and permission of instructor.

181–82 Seminar: Applied Mathematics (3–3) Glick

Prerequisite: Math 140, Stat 189-90, some knowledge of linear algebra, senior status as major in Applied Mathematics. (Academic year)

191 Special Topics (arr.) **Staff**

Admission by permission of instructor. May be repeated for credit. Offered upon demand.

195 Reading and Research (arr.) **Staff**

Under the personal direction of an instructor. Limited to mathematics and applied mathematics majors with demonstrated capability. Prior approval of instructor required. May be repeated for credit. (Fall or spring)

Third Group

Requirements for graduate degrees in mathematics at George Washington University are described on pages 367–68. Courses in mathematics for the fulfillment of these requirements are given jointly by Catholic University of America, George Washington University and Georgetown University each year at one location (1977-78—Catholic University of America).

Courses marked with an asterisk (*) are offered every year.

1977-78 Teaching Staff from Cooperating Universities

CATHOLIC UNIVERSITY OF AMERICA

Professors Victor Bogdan, Parfeny Saworotnow
Associate Professors Gustav Hensel, Francis Sullivan, John Welch
Assistant Professors Charles Byrne, Leonard Gallagher, Daniel Gallo, James Hagler, Charlene Williams

GEORGETOWN UNIVERSITY

Professors John Lagnese, Herbert Maisel, Arnold Stokes
Associate Professors E. Ray Bobo, Richard Datko, J. Roger Teller
Assistant Professors George Benke, Giuliano Gnugnoli, Ronald Rosier, Allen Tucker, James Sandefur, Andrew Vogt, John Baillieul

ALGEBRA

***201 Graduate Algebra I (3)** Teller
Groups, including Sylow theorems, direct decomposition of finitely generated Abelian groups, solvable nilpotent and simple groups, free groups. (Fall)

***202 Graduate Algebra II (3)** Teller
Rings, including prime and maximal ideals, Euclidean and unique factorization domains, polynomial rings; modules over rings, including tensor product; semi-simple rings and algebras, including the Wedderburn theorem; Noetherian rings, including primary decomposition theorem. Prerequisite: Math 201 or permission of instructor. (Spring)

203 Graduate Algebra III (3) Katz
Fields, including Galois theory, valuation theory. Prerequisite: Math 202 or permission of instructor. (Fall)

204 Rings and Homology (3)
Prerequisite: Math 202 or permission of instructor.

205 Homological Algebra and Category Theory (3)
Categories, functors, natural transformations; examples; functor categories, quotient categories; universal arrows, limits; adjoint functors, monads (triples); Abelian categories; imbedding theorems; modules, projective and injective; extensions and satellites, Ext and Tor. Prerequisite: Math 202 or permission of instructor.

206–7 **Quadratic Forms I-II** (3–3)
Prerequisite: undergraduate course in linear algebra

208 **Combinatorics** (3) Bari
Prerequisite: undergraduate modern algebra and linear algebra. (Fall)

209–10 **Representations of Groups I-II** (3–3)
Prerequisite: Math 202 or permission of instructor

211 **Group Theory I** (3)
Infinite Abelian groups. Topics include direct sums and products, free Abelian and finitely generated Abelian groups, divisible groups, pure subgroups and basic subgroups. Prerequisite: Math 201.

212 **Group Theory II** (3)
Prerequisite: Math 211.

213 **Nonassociative Algebras** (3)
Lie and Jordan algebra. Prerequisite: Math 202.

214 **Algebraic Number Theory** (3)
Prerequisite: Math 203 or permission of instructor

215 **Topics in Algebra** (3) Katz
New topic each semester. May be repeated for credit

216 **Graph Theory** (3) Bari
Selected topics in graph theory from introductory topics to problems currently of research interest. (Spring)

ANALYSIS AND APPLIED MATHEMATICS

217–18 **Mathematical Methods for the Social Sciences I-II** (3–3)
Topics: convex sets and functions; nonlinear programming; systems of ordinary differential equations and difference equations and stability theory; calculus of variations; optimal control theory; graph theory; Markov chains and other stochastic processes; mathematical learning theory. Prerequisite: Math 32, 124 or equivalent, graduate standing in a social science department, or permission of the instructor.

*220 **Introduction to Modern Analysis** (3) Vogt
Real numbers, least upper bounds, completeness, Bolzano-Weierstrass theorem, Banach spaces, examples: R^n, $C[a, b]$, l_1, l_2, Hilbert spaces; limits of real and vector sequences, limits of real and vector functions, all basic properties of real and vector continuous functions, differentiation and integration of real and vector functions, basic properties of compact sets, closed and open sets, linear transformations on R^n to R^m, fixed-point theorem and applications to differential and integral equations, Fourier series, Stone-Weierstrass theorem. (Fall)

*221 **Introduction to Complex Analysis** (3) Rosier
Algebra, geometry, and topology of complex numbers; definitions and properties of elementary functions, e.g., e^z, sin z, log z; integrals,

functions defined by integrals: Cauchy's theorem and formula, integral representation of derivatives of all orders; maximum modulus, Liouville's theorem, fundamental theorem of algebra; Taylor and Laurent series uniform convergence, term-by-term differentiation; domain of convergence and classification of singularities; contour integration; the residue theorem; evaluation of integrals involving single-valued functions; analytic continuation, multivalued functions, and branch points; technique for contour integrals involving multivalued functions. Prerequisite: Math 220 or equivalent. (Fall)

222 **Applications of Complex Analysis** (3) Henney

Potential theory and conformal mapping. Special functions. Asymptotic expansions; steepest descent, stationary phase, and WKB methods. Fourier and Laplace transforms, applications to partial differential equations. Wiener Hopf method, dual and singular integral equations. Prerequisite: Math 221 or an undergraduate course in complex variables. (Spring)

223 **Advanced Complex Analysis** (3)

Harmonic functions, partial fractions, Mittag-Leffler theorem; infinite products, entire functions, the Hadamard product theorem, the gamma function, representations of the gamma function; Hurwitz's theorem, normal families of functions, Montel's theorem, the Riemann mapping theorem, elementary conformal mapping; analytic continuation, the monodromy theorem, branch points, Riemann surfaces. Prerequisite: Math 221 or equivalent.

*224 **Measure and Integration Theory** (3) Rosier

Lebesgue integration over the space of reals: the basic convergence theorems, including monotone and dominated convergence theorems; measurability; almost everywhere differentiability of monotone functions, absolute continuity; the Lp spaces and orthogonal expansions; duality of Lp and Lq spaces; orthonormal systems in L_2 (a, b); integration over the space R^n; theorems of Fubini and Tonelli. Prerequisite: Math 220 or equivalent. (Spring)

*225 **Introduction to Functional Analysis** (3) Williams

Topological and metric spaces; compact spaces and Tychonoff theorem; complete metric spaces and completion of a metric space. Normed and Banach spaces; linear functions; Hahn-Banach theorem, principle of uniform boundedness and applications; elementary introduction to distribution theory; linear operators; the closed-graph theorem and interior mapping principle; Hilbert spaces; inner product, orthogonality, and orthonormal systems; eigenvalues, eigenvectors, invariant subspaces, and projection operators; operational calculus of functions defined on the spectrum. Prerequisite: Math 220 or equivalent. (Fall)

*226 **Banach Algebras and Special Theory of Operators** (3) Saworotnow

Gelfand theory of commutative Banach algebras; function algebras; Stone Cech compactification; application to the spectral theory of operators, spectral theorem for bounded and unbounded operators; Jacobson radical for arbitrary Banach algebras; H*-algebras and Hilbert modules; related topics. Prerequisite: knowledge of measure and integration, introduction to functional analysis, and Tychonoff and Stone-Weierstrass theorems. (Spring)

227 **Fourier Analysis on Locally Compact Groups** (3)

Elementary properties of topological groups, existence of Haar measure, modular functions, group algebras; application of Gelfand theory to the group algebra; applications to classical theory of Fourier series and integrals; compact and discrete groups. Plancherel and Pontryagin theorems; positive definite functions and positive linear functionals, Stone and Bochner theorems; representations of a compact group G; H^*-algebra valued positive definite functions, generalization of Stone and Bochner theorems, their application to multivariate and infinite dimensional stationary processes; related topics. Prerequisite: knowledge of topological groups, measure and integration, an introduction to functional analysis, and some familiarity with Gelfand theory.

228 **Theory of Generalized Functions and Distributions** (3) Bogdan

Fréchet and countable union spaces; definition, structure, and properties of Schwartz distributions and generalized functions; applications to explicit solutions and existence theory of ordinary and partial differential equations, nested Hilbert spaces; generalized Fourier transform. Prerequisite: Math 220 or permission of instructor. (Spring)

229 **Ergodic Theory** (3)

Topics selected to serve research interests of instructor and students; emphasis on recent developments and applications to dynamical systems and Markov processes. Prerequisite: Math 224, 225; or permission of instructor.

230 **Differential Equations in Banach Space** (3)

General theory of linear and nonlinear differential equations in Banach space; periodic and almost periodic solutions; stability of solutions. Prerequisite: Math 225 or permission of instructor.

231 **Semi-groups of Operators and Almost Periodic Functions** (3)

Almost periodic functions on the real line and on groups; general theory of weakly almost periodic semi-groups of operators, their asymptotic behavior and convergence into almost periodic groups of operators. Prerequisite: Math 224, 225, 226; or permission of instructor.

232 **Seminar: Functional Analysis** (3)

Topics selected to serve research interest of instructor and students; qualified students encouraged to work on research projects. May be repeated for credit. Admission by permission of instructor.

233 **Foundations of Probability Theory and Statistics** (3) Junghenn

Review of the basic concepts of measure and integration theory; probability and expectation; random variable, random process; distribution function and Kolmogorov consistency theorem; characteristic function of a random variable; distributions of Bernoulli, Poisson, Gauss, Polya, Cauchy, Laplace; applications; stochastic independence; Kolmogorov's strong law of large numbers; central limit theorem; applications to statistics. (Fall)

234 **Introduction to the Theory of Random Processes** (3) Byrne

Stochastic dependence, conditional expectation, limit theorem for submartingales; Markov process; theory of Markov chains; Poisson's

process; process of birth and death; Kolmogorov-Chapman equations; second order stationary random processes; filtering and prediction; Wiener-Hopf equation and its solution. second-order discrete stationary random processes. Prerequisite: Math 233. (Spring)

236–37 **Introduction to Optimization Theory in Hilbert Spaces I-II** (3–3)

Basic methods of functional analysis applicable to optimization problems in control, communication, and other areas in system science. Topics covered include review of basic properties of Hilbert spaces, operators, compact and nuclear operators, semigroups of linear operators, measure theory in Hilbert spaces, problems in control theory, information theory, convex programming and games. Prerequisite to Math 236: Math 224, 225. Prerequisite to Math 237: Math 236.

238 **Introduction to Probability Theory** (3)

Discrete and continuous probability distributions; conditional probability; random variables; expectation, binomial, Poisson, and normal distributions; laws of large numbers. Markov chains; applications. Prerequisite: knowledge of advanced calculus.

239 **Introduction to Stochastic Processes** (3)

Brief discussion of probability theory, general notion of stochastic process, normal processes and autocovariance function, Wiener process, harmonic analysis of processes, Poisson process, renewal counting processes, Markov chains with discrete and continuous parameter.

*240 **Introduction to Ordinary Differential Equations** (3) Sullivan

First course in ordinary differential equations: existence and uniqueness of solutions; continuity of solutions with respect to initial conidtions; properties of linear systems. Prerequisite: advanced calculus. (Fall)

241 **Stability Theory of Ordinary Differential Equations** (3)

Introduction to basic notions of stability and asymptotic stability. Liapounov's functions used to establish stability or instability; converse theorems of Liapounov's direct method, comparison theorems differential inequalities. Prerequisite: Math 240 or permission of instructor.

242 **Theory of Dynamical Systems** (3)

Basic properties of dynamical systems; α and ω limits sets, recurrent motions, minimal sets; ergodic motions, ergodic theorems of Birkhoff and Von Neumann Prerequisite: Math 240 or permission of instructor

243 **Theory of Nonlinear Oscillations** (3)

Existence and stability of periodic solutions of ordinary differential equations; derivation of bifurcation equation for weakly nonlinear systems; introduction to the method of averaging, the existence and stability of almost periodic solutions and integral manifolds. Prerequisite: Math 240 or permission of instructor.

245 **Eigenvalue and Boundary-value Problems** (3)

Normed spaces, integral equations, spectral theory of compact operators; application to boundary and eigenvalue problems of ordinary differential equations. Prerequisite: advanced calculus.

246 **Numerical Methods in Ordinary Differential Equations** (3)

Finite difference methods for initial-value and boundary-value problems: error analysis, analysis of stable schemes. Galerkin's method, with estimation of error in eigenvalue problems. Prerequisite: Math 240 or permission of instructor.

247 **Control Theory of Ordinary Differential Equations** (3) Baillieul

Optimal control of linear systems, control of linear systems with convex cost functionals, the maximal principle and selected topics on control systems. (Spring)

248 **Fourier Analysis and Integral Transforms** (3) Benke

Fourier series, Fourier integral in one and several variables, Fourier-Stieljes transform, inversion of Fourier transforms. Tauberian theorems, bilateral Laplace transform and applications. Prerequisite: advanced calculus, knowledge of Lebesgue integration, acquaintance with the elementary parts of the theory of functions of a complex variable. (Fall)

249 **Differential Games** (3)

The idea of a differential game. Examples, discrete games, procedures for solving certain types of games, and the study of surfaces involved in solving differential games.

250 **Calculus of Variations** (3)

Introduction to the calculus of variations via the notion of the Frechet derivative, the Euler equations, the Hamilton-Jacobi equations; sufficient conditions for a solution to exist, applications to mechanics and physics.

251–52 **Techniques of Partial Differential Equations I-II** (3–3)

Math 251: Study of classical first and second order equations in two to four variables. Applications to probability theory and mathematical physics. Prerequisite: knowledge of advanced calculus and rudiments of linear algebra and complex variables. Math 252: First order equations and systems in n variables. Hamilton-Jacobi theory. Characteristics and bicharacteristics. Variational methods. Integral equations. Prerequisite: Math 251, knowledge of undergraduate linear algebra and analytic function theory. (Academic year)

253–54 **Introduction to Numerical Analysis I-II** (3–3) Hagler

Elements of theory and practice of numerical analysis using modern digital computers; solution of linear systems and nonlinear equations; computation of eigenvalues and eigenvectors; basic approximation theory; interpolation techniques; numerical quadrature; solution of differential equations. Prerequisite: knowledge of advanced calculus. (Academic year)

255 **Introduction to Generalized Functions and Fourier Transforms** (3)

Sequential definition of generalized functions—operational solution of differential equations and systems. Generalized function Fourier series, generalized function Fourier and Laplace transforms, applications to initial and boundary-value problems. Prerequisite: Math 220 or knowledge of advanced calculus.

257 **Control Theory of Partial Differential Equations** (3)

Minimization of functionals and boundary-value problems: control of

systems governed by elliptic partial differential equations; control of systems governed by parabolic partial differential equations; control of systems governed by hyperbolic partial differential equations; regularization, approximation, and penalization.

258 **Introduction to Finite Element Methods** (3)

Numerical treatment of the typical boundary-value problems for parabolic and elliptic equations of mathematical physics; finite element methods, solutions, convergence to solutions of partial differential equations; error analysis, suitability of methods for practical use in digital computers.

259–60 **Introduction to System Theory: Control and Optimization I-II** (3–3)

Analysis of control systems of various types. States and system dynamics and problems of control and optimization. Prerequisite: background in advanced calculus and linear algebra.

261 **Applied Linear Algebra** (3)

Application of linear algebra to problems occurring in ordinary differential equations, stochastic processes, control theory, and the social and life sciences.

262 **Linear Programming** (3)

Study of convexity and its application to linear programming.

264 **Approximation and Curve Fitting** (3)

General introduction to theory and computational methods of linear approximation; emphasis on least squares and uniform approximation, including discussion of computer implementation of widely used algorithms; programming assignments dealing with typical applications. Prerequisite: knowledge of advanced calculus.

265 **Computational Methods for Nonlinear Problems** (3)

Topics in the area of optimization and function minimization; emphasis on analytic and computational aspects of nonlinear iterative methods and their applications to various physical problems; programming assignments dealing with typical applications. Prerequisite: knowledge of advanced calculus.

†266 **Computer Mathematical Languages with Applications I** (3)

Timesharing system. Elements of BASIC: syntax, numerical scale, error estimates in computation. Elements of PIP, TECO, and MONITOR COMMANDS. FORTRAN IV: syntax, numeric scales and their use. Subroutines: local and global variables; function subroutines. Applications. Use of subroutine libraries. Business type applications. Prerequisite: knowledge of calculus.

†267 **Computer Mathematical Languages with Applications II** (3)

Review of timesharing systems: PIP, TECO, MONITOR COMMANDS. FORTRAN IV. ALGOL. Control of peripheral devices from FORTRAN, ALGOL, and file capability. Generation of programs in MONITOR LEVEL and their applications. Use of system utility programs. Prerequisite: knowledge of advanced calculus and elements of FORTRAN or BASIC.

† This course is not intended for computer science specialists.

268 **Introduction to Applied Mathematics** (3)

Sampling of topics in applied mathematics treated in an introductory manner with emphasis on interest rather than technique; the two-body problem, Hamiltonian and Lagrangian formalism, heat and wave equations, matrix models in biology and economics

COMPUTER SCIENCE

270–71 **Simulation of Discrete Stochastic Systems I-II** (3–3)

Introduction and definition of simulation system, discrete and continuous, stochastic and deterministic, critical event and time-slice; general outline of a simulation, how it is used and how it functions; procedure for developing a simulation; statistical topics; generating random numbers. Simulation programming and languages, simulating the passage of time and arrivals, FORTRAN, queues and list processing, PL/1, SIMSCRIPT, GPSS, general remarks; GPSS, basic concepts; simulation of computer systems, case study. Prerequisite: knowledge of computers and statistics.

272 **File and Data Management and Information Processing** (3) Gnugnoli

External data structures, graph theory, paths, chains, trees, lists, sublists, multilinked lists, directories; basic structure-processing operations, creation, updating, sorting, merging, searching linkage, hashing, Boolean searches; storage media and input output devices; software; introduction to file organizations; consecutively organized files; keyed files; file arrangement and application; introduction to the processing, storage, and retrieval of data, emphasis on computer techniques. Prerequisite: introduction to data structures and PL/1 programming. (Fall)

273 **Theory of Formal Languages and Applications** (3) Tucker

Introduction to formal languages and their related automata, applications to compiler design. Regular, context-free, context-sensitive, and unrestricted grammars; finite and pushdown store automata; Turing machines; the halting problem; formal description of programming languages' syntax and semantics; syntax-directed compiling techniques; compiler-compilers; additional topics in compiler construction. Prerequisite: introductory computer course; course in abstract algebra is recommended. (Fall)

274 **Compiler Construction** (3) Tucker

Prerequisite: Math 273. (Spring)

275 **Operating Systems** (3) Gnugnoli

Prerequisite: introduction to systems programming, intermediate calculus, college algebra, proficiency in FORTRAN or PL/1 programming. (Spring)

276 **Artificial Intelligence** (3)

Heuristic and the algorithmic methods of programming, theorem-proving, pattern recognition, verbal and concept learning simulators and decision-making. Prerequisite: beginning course in computers and statistics.

277 **Comparative Computer Organization** (3)

Arithmetic and nonarithmetic processing facilities, memory utilization and storage management, addressing schemes, control mechanisms, input-output facilities and special design features. Prerequisite: background in computer organization and assembly language programming.

LOGIC

*278 **Introduction to Mathematical Logic** (3) Hensel

Propositional and predicate calculus (first order) syntax, formation rules, semantics, axioms, proof and deduction, object vs. metalanguage, deduction theorem, compactness theorem, Godel Henkin completeness theorem, Craig's interpolation theorem, Beth's definability theorem. First-order recursive arithmetic: incompleteness and undecidability. (Fall)

279 **Model Theory** (3)

Prerequisite: Math 278 or permission of instructor.

280 **Proof Theory** (3)

Prerequisite: Math 278 or permission of instructor.

281 **Computability and Decidability** (3)

Prerequisite: Math 278 or permission of instructor.

282 **Set Theory** (3)

Prerequisite: Math 278 or permission of instructor.

283 **Topics in Computational Complexity** (3) Sullivan

Prerequisite: Math 278 or permission of instructor. (Spring)

TOPOLOGY

*285–86 **General Topology I-II** (3–3) Green

General topological spaces, continuity, quotient spaces, product spaces, filters, nets, separation axioms, compactness and connectedness (global and local). Metrization, compactification, uniform spaces, uniform continuity, complete spaces, and topological groups. (Academic year)

287–88 **Topological Vector Spaces I-II** (3–3) Taam

Topological vector spaces, vector space topologies, linear manifolds, metrizability and complexification. Locally convex topological vector spaces. Hahn-Banach theorem, projective and inductive topologies, barreled and bornological spaces. Linear mappings, Banach's homomorphism theorem, equicontinuity, uniform boundedness and the Banach Steinhaus theorem. Tensor products, nuclear mappings and spaces. Duality, dual systems and weak topologies; Mackey-Arens theorem; strong dual, bidual, and reflexive spaces; theorems of Grothendieck, Banach-Dieudonne, and Krein-Smulian; open mappings and closed graph theorems; weak compactness; theorem of Eberlein and Krein. Prerequisite: general topology, including uniform spaces, linear algebra, and real and complex variables. (Academic year)

289 Topological Groups (3)

General theory of topological groups: neighborhood systems of the identity; uniform structures on groups, products, and inverse limits. Locally compact groups, classical linear groups, Lie groups. Open homomorphism and closed graph theorems, integration on locally compact groups, finite-dimensional representations of groups, Schur's lemma, Peter-Weyl theorem, structure of metrizable compact groups. Duality, dual groups of locally compact Abelian groups, dual groups of compact and discrete groups. Prerequisite: general topology, including uniform spaces, linear algebra, and elementary group theory.

290 Differentiable Manifolds (3)

Differentiable manifolds, tangent vectors and differentials, submanifolds, imbeddings and immersions, quotient manifolds, vector fields, Frobenius' theorem, tensors and differential forms, Lie derivatives, manifolds with boundary, orientable manifolds, Stokes' theorem, and the divergence theorem. Prerequisite: advanced calculus, linear algebra; or permission of instructor.

291 Differential Geometry (3)

Riemannian manifolds, geodesics, curvature and torsion, linear connections, Gauss-Bonnet theorem, Hopf index theorem, Morse index theorem; applications to mechanics, cohomology, and the de Rahm theorem; the Laplace-Beltrami operator; Lie groups. Prerequisite: Math 290.

292 Introduction to Homotopy Theory (3)

Two-dimensional manifolds, classification theorem for compact surfaces, the fundamental group, homotopy type, homotopy equivalence of spaces; free groups and free products of groups, presentation by generators and relations; Seiffert-Von Kampen theorem, covering spaces of a graph, applications to group theory.

293 Introduction to Homology Theory (3)

Axioms and uniqueness, Eilenberg-Steenrod axioms and some immediate consequences. Uniqueness theorem. Computation of homology groups, elementary applications, e.g., invariance of dimension, extensions and retractions, fixed-point theorems, etc. Cellular homology groups, singular homology theory.

RESEARCH

*295 **Reading and Research** (3) **Staff**

May be repeated once for credit. (Fall and spring)

*299–300 **Thesis Research** (3–3) **Staff**

(Fall and spring)

Fourth Group

*398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

*399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MICROBIOLOGY

Professors M.L. Robbins, R. Hugh, L.F. Affronti *(Chairman)*, E.M. Lerner II *(Research)*
Professorial Lecturer D.H. Heilman *(Cellular Immunology)*
Associate Professors M. Reich, K. Huang, P.D. Kind, Y. Chu *(Research)*
Assistant Professors R.F. DeGiovanni-Donnelly *(Research)*, M.R. Lord *(Research)*

Master of Science in the field of microbiology—Prerequisite: a bachelor's degree with a major in biological or physical sciences from this University or an equivalent degree. The undergraduate program must have included the following courses or equivalent: BiSc 11–12; Chem 11–12, 151–52, 153–54; Math 31 (31 may be taken concurrently with the graduate program); Phys 1, 2.

Required: the general requirements, pages 89-97. A total of 30 semester hours is required, 24 hours of coursework and six hours of thesis (Micr 299-300). The coursework must include Micr 211, 212 (if not taken prior to admission), plus Bioc 221-22; Micr 219-20, 277-78; and an approved biostatistics course. The remaining academic work should consist of graduate-level courses selected with the approval of the instructor.

Doctor of Philosophy in the field of microbiology—Required: the general requirements, pages 89-91, 97-99. Candidates must fulfill the tool requirement by completing an approved course in biostatistics and by passing a reading knowledge examination in French or German. The General Examination covers at least four fields, two of which must be in microbiological disciplines.

Research fields: clinical microbiology, determinative bacteriology, immunochemistry, immunology, microbial genetics, microbial pharmacology, microbial physiology, and virology.

211 **Microbiology** (4) Staff
Survey of bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221-22 or other biochemistry course, and permission of instructor. Laboratory fee, $20. (Fall)

212 **Pathogenic Bacteriology** (3) Hugh
(Formerly Pathogenic Microbiology [4])
Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial diseases of man. Prerequisites: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 **Tissue Cell Culture and Somatic Variation** (4) Chu
Techniques of tissue culture and means of studying somatic variations. Prerequisite: Micr 211 or equivalent. (Spring)

215 **Medical Parasitiology** (2) Staff
Study of host-parasite relationships. Clinical recognition of important parasites in medicine.

219 **Scientific Writing for Graduate Students** (1) Robbins
(Formerly Micr 219–20 [1–1])
Required of all graduate students prior to writing a thesis or dissertation. Some research experience required. (Fall)

225 **Microbial Physiology I** (3) Reich, Affronti
Morphology and biochemistry of various microorganisms with emphasis on bacteria. Prerequisite: Bioc 221-22, Micr 211, or equivalent. (Fall)

226 **Microbial Physiology II** (3) Reich, Affronti
Effects of physical and chemical agents on microorganisms with emphasis on antibiotics. Prerequisite: Micr 225 or permission of instructor. (Spring)

229 **Immunology** (3) Kind, Affronti
Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen-antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor. (Fall)

230 **Immunology Laboratory** (2) Kind, Affronti
Serologic and immunologic procedures as applied to clinical and research situations emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind
Study of immunological functions of reticulo-endothelial tissues, theories of auto-immunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Clinical faculty discuss relevant aspects of immunobiology. Prerequisite: Micr 201* or 229, and permission of instructor. (Fall)

233 **Virology** (3) Robbins, Huang
(Formerly Biology of Viruses [2])
Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology—Laboratory** (2) Robbins, Huang
(Formerly Biology of Viruses—Laboratory)
Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh
History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 212 or equivalent. (Fall, odd years)

†240–41 **Biomedical Instrumentation** (4–4) Staff
Same as Bioc 225–26 and Phys 223–24. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification, and quantification of materials of interest to biomedical scientists. Laboratory fee, $50. (Academic year)

* For description of Micr 201 see the *School of Medicine and Health Sciences Bulletin*
† An interdisciplinary course offered by the Biochemistry, Microbiology and Physiology Departments

251 **Clinical Laboratory Bacteriology** (3) Hugh
For graduate students; open to medical students. Detection and identification of bacterial agents which cause diseases in humans. Comparative isolation and identification methods; emphasis on interpretation and significance of laboratory observations. Prerequisite: Micr 212 or equivalent. (Fall, even years)

255 **Clinical Virology** (1) Huang
(Formerly Virology)
General principles of virology; emphasis on clinical situations. Prerequisite: Micr 212 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti
Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221-22 or equivalent, Micr 229. Laboratory fee, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly
Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 **Cellular Immunology** (1) Kind
Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 **Seminar: Microbiology** (1–1) Staff
Required of graduate students. (Academic year)

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 **Research in Microbiology** (arr.) Staff
Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MUSEUM STUDIES—GRADUATE PROGRAM

Committee on Museum Studies

R.L. Humphrey, Jr., R.K. Lewis *(Chairman)*, W.A. MacDonald, B.M. Mergen, C.R. Rose

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in Museum Studies. This program provides students with a broad background in museum studies, including a variety of specialized approaches to a museum career with concentration in conservation, collections management, exhibiting, administration, and museum education. An interdisciplinary committee composed of members drawn from the Departments of Anthropology and Art, from the American Studies Program, and from the Smithsonian Institution—administers the program under Graduate School supervision.

Students applying for candidacy in the Museum Studies Program must meet all general requirements for admission to the Graduate School of Arts and Sciences, including a baccalaureate degree with a major, or its equivalent, in anthropology, art history, American studies, or natural science. In addition, the student must have taken at least six credit hours in each of these fields and at least nine credit hours in one of them other than the student's undergraduate major, or must show equivalent preparation. There are additional prerequisites for specialization in ethnographic or archeological conservation.

Master of Arts in Museum Studies—Required: the general requirements, pages 95–97. The degree requires a minimum of 42 hours of course work. At least 15 hours are to be devoted to courses in the museum field, and a further six to 12 hours may be in museum internship. The remaining hours should be in the core discipline or in one or more related disciplines. The student must pass a comprehensive examination based on course work and submit a research paper of publishable quality. In addition, students must pass a reading examination in an approved foreign language or may substitute an approved course in statistics or computer programming. For those specializing in ethnographic conservation, organic chemistry may be substituted.

AMERICAN CIVILIZATION

250 *Orientation Course: Material Aspects of American Civilization*
251–52 *Museum Research and Education*
270 *Seminar: Museum Exhibiting*
294 *Field Research in Historical Archeology*

ANTHROPOLOGY

211 *Problems in Conservation*
212 *Advanced Conservation Techniques*
264 *Seminar: Museum Techniques*
270 *Seminar: Museum Exhibiting*
290 *Advanced Museum Research*
291 *Seminar: Museology*
292 *Introduction to Conservation*
293 *Conservation Laboratory Techniques*

ART

129–30 Principles of Museum Work (Required of all students)
201–2 *Museum Projects*
209–10 *Exhibition and Display Design*

213 *Museum Administration and Government*
214 *Museum Administration and Trusteeship*
217–18 *Problems in Museum Work*
271–72 *Museum Techniques*
292 *Introduction to Conservation*

EDUCATION

310 *Museum Studies*
311 *Museum Audiences*
312 *Internship in Museum Education*

MUSIC

Professor G. Steiner *(Chairman)*, R. Parris
Associate Professor N.A. Tilkens
Adjunct Assistant Professor M.C. Tolson *(Piano)*
Assistant Professorial Lecturers N.O. Scribner, Jr. *(Organ)*, R.J. Guenther, B. Feinstein, A.T. Rachal
Studio Lecturers in Applied Music W.B. Dobry *(Piano and Organ)*, S.K. Kim *(Piano)*, M. McNabb *(Piano and Organ)*, Y.F. Novik *(Piano)*, M. Peris *(Piano)*, C.A. Russell *(Piano)*, C.O. Dash *(Voice)*, S.H. Prussing *(Voice)*, J.E. White *(Voice)*, R. Parnas *(Violin and Viola)*, R.A. Norris *(Guitar)*, R.C. Raffaelle *(Guitar)*, D.C. Jarvinen *(Cello)*, J.S. Martin, Jr. *(Cello)*, N.M. Irvine *(Bass)*, W.E. Fuhrman *(Flute)*, W.H. Mann *(Flute)*, T.P. Perazzoli *(Flute)*, R.O. White *(Oboe)*, W.R. Wright *(Clarinet and Saxophone)*, L. Lipnick *(Bassoon and Recorder)*, S.E. Ramsay *(French Horn)*, G.W. Recker *(Trumpet)*, R.H. Kraft *(Trombone and Recorder)*, T.H. Wardlow *(Percussion Instruments)*, B.R. Seidman *(Harp)*, M.K. Kuper *(Flute)*, M.C. Sislen *(Guitar)*.

Bachelor of Arts with a major in music history and literature, music theory or applied music (departmental)– The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.

2. Prerequisite courses– Mus 2, 5 6, six hours of applied music lessons, a minimum of four semesters in music ensemble groups (or evidence of equivalent experience).

3. Required courses in related areas—12 hours of one foreign language (French, German or Italian recommended).

4. Required courses in the major—Mus 103–4, 131–32; six additional hours of music theory courses; six additional hours of music history and literature courses; plus six hours of courses in the area of the major. (Music theory majors must meet departmental requirements for proficiency in piano; applied music majors must perform a complete public recital or the equivalent in major solo performances.)

Master of Arts in the field of musicology—Prerequisite: a bachelor's degree with a major in music, or an equivalent degree.

Required: the general requirements, pages 89–97. The program of study consists of (1) 30 semester hours of course work including a thesis (six semester hours), or (2) with the approval of the department, 30 semester hours of course work without a thesis.

Master of Music in the field of music theory, music composition, conducting, or applied music. Prerequisite: a bachelor's degree with a major in music or an equivalent degree.

Required: the general requirements, pages 89–97. The required second- and third-group course work is as follows:

1. *In the field of music theory*—Thirty semester hours of course work including either (a) a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques, or (b) with the approval of the department, six semester hours of music theory courses in lieu of a thesis.

2. *In the field of music composition*—Thirty semester hours of course work including a creative thesis of one composition in large form properly prepared for performance (chamber music, a symphonic form, or a choral work with orchestral accompaniment) including a written theoretical, formal, and harmonic analysis of the work.

3. *In the field of conducting*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques; or, with the approval of the department, 30 semester hours of course work without a thesis. The requirements also include an acceptable public conducting performance.

4. *In the field of applied music*—Thirty semester hours distributed as follows: (a) 12 semester hours of applied music in the area of concentration; (b) 12 semester hours of music theory and music history and literature courses; and (c) a thesis (six semester hours). The thesis consists of a public recital and performance before a designated committee; such a recital and performance must be representative of an extensive and well-rounded repertory, performed on a professionally accepted artistic level, and delivery of an historical and analytical lecture on the musical content of the program; demonstrated leadership in an ensemble performance (opera or oratorio for voice); and a written report on some approved theoretical area related to the student's concentration.

Bachelor of Art in Education with a teaching field in music.—Prerequisite: the education curriculum, pages 111–12.

Required: the music option and professional courses listed on pages 115–16.

MUSIC HISTORY AND LITERATURE

First Group

3 **Introduction to Musical Understanding** (3) Steiner, Tilkens

Introductory history of musical styles, related to listening; elements and materials of music. (Fall and spring)

4 **Survey of Music Literature** (3) Steiner

Introductory study of musical forms, structures, and textures; aural analysis of selected literature. (Spring)

7 **Music of Nonwestern Cultures** (3) Tilkens

Introductory survey of the basic systems and styles of music in the major cultures of the Eastern Hemisphere and Africa.

8 **History of Jazz** (3) Staff

Introduction to the styles, composers, and performers of jazz music from its origins to the present.

Second Group

103–4 **History of Music** (3–3) Tilkens
Development of music in the Western World from the early Christian Era to the present. (Academic year)

105 **Music of the Baroque Period** (3) Tilkens
Study of the musical styles, techniques, and literature from 1600 to 1750. (Spring)

106 **Music of the Classic Period** (3) Tilkens
Study of styles, techniques, and literature from the 18th century schools through Haydn, Mozart, and Beethoven. (Fall)

107 **Music of the Romantic Period** (3) Feinstein
Study of the musical styles, backgrounds, and literature from Schubert through the 19th century. (Fall)

108 **Music of the 20th Century** (3) Steiner
The principal schools, techniques, developments, and trends of the 20th century.

109 **Orchestra Literature** (3) Steiner
Survey of the history and styles of orchestra literature, analysis of representative works. (Fall)

110 **Chamber Music Literature** (3) Steiner
Survey of the history and styles of chamber music literature, analysis of representative works.

121 **The Opera** (3) Feinstein
Survey of the history and styles of opera, analysis of representative works. (Spring)

125 **Keyboard Music Literature** (3) Tilkens
Survey of the history, style, and major content of the keyboard literature from the 16th century to the present.

140 **Music Therapy** (3) Rachal (Fall)
Introduction to principles and techniques of music therapy.

173 **Piano Pedagogy** (3) Tolson
Principles, materials, and methods of piano teaching. (Spring)

199 **Independent Research** (3) Staff
Under the guidance of an assigned instructor. Open only to qualified music majors. May be repeated for credit. (Fall and spring)

Third Group

203 **Bibliography and Research Methodology** (3) Guenther
(Fall)

234 **Seminar: Performance Practices in Selected Areas** (3) Tilkens
Topic for 1977: 18th century keyboard performance. (Fall)

238 **Seminar: Analytical Studies in Music History** (3) Tilkens
Topic for 1978: Brahms. (Spring)

239 **Independent Research** (3) Staff

MUSIC THEORY

First Group

1 Elements of Music Theory (3) — **Staff**

Notation, scales, keys, intervals, terms, rhythms, and chord structure. (Fall and spring)

2 Ear-training (3) — **Staff**

Melodic and harmonic dictation, ear-training, sight-singing, elementary keyboard harmony. (Spring)

5–6 Harmony (3–3) — **Guenther**

Triads, inversions; chord analysis, construction, and progression; part-writing, modulations, altered chords. Prerequisite: Mus 1 or satisfactory passing of placement examination. (Academic year)

Second Group

131–32 Advanced Theory (3–3) — **Parris**

Practice in 18th century contrapuntal writing and analysis, chorale preludes, inventions, and fugues. Prerequisite: Mus 5–6 or equivalent. (Academic year)

135 Counterpoint (3) — **Parris**

Study and practice of 16th century contrapuntal techniques. (Spring)

137 Orchestration (3) — **Parris**

Instrumental scoring. (Fall)

138 Form and Analysis (3) — **Parris**

Analysis of musical forms in representative musical literature. (Spring)

151 Conducting (3) — **Steiner**

Technique of conducting, score reading, rehearsal procedures, analysis, and interpretation of selected musical literature; practice in conducting. (Spring)

160 Electronic Music — **Staff**

Tape and electronic techniques, synthesizer use, and acoustical principles. (Spring)

Third Group

231–32 Composition (3–3) — **Parris**

May be repeated for credit. (Academic year)

237 Seminar: Analytical Studies in Music Theory (3) — **Parris**

Topic for 1977: Renaissance counterpoint. (Fall)

251 Advanced Conducting (3) — **Steiner**

(Spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

APPLIED MUSIC

All applied music courses may be repeated for credit.

All applied music courses are offered both fall and spring.

Mus 51, 52, 53, 54 and 55 do not include individual lessons and do not require a supplementary fee. All other applied music courses include individual lessons and require a supplementary fee, as follows:

1. One-semester-hour courses: individual lessons of one-half hour a week, supplementary fee, $75.
2. Three- or six-semester-hour courses: individual lessons of one hour a week, supplementary fee, $100.

Supplementary fees for applied music courses are nonrefundable after the first three weeks of the fall and spring semesters. Supplementary fees are different for courses offered during the summer sessions. Consult the Music Department for details.

The supplementary fee is waived for graduate degree candidates in music and full-time undergraduate music majors.

First Group

Required practice: three hours a week for one-semester-hour courses and six hours a week for three-semester-hour courses. In addition, three-semester-hour courses include assigned workshops in theory and performance.

11 Piano (1) Staff
12 Piano (3) Staff

13 Voice (1) Staff
14 Voice (3) Staff

15 Organ (1) Scribner, McNabb, Dobry
16 Organ (3) Scribner, McNabb, Dobry

17 Violin (1) Steiner, Parnas
18 Violin (3) Steiner, Parnas

19 Classical Guitar (1) Norris, Raffaelle, Sislen
20 Classical Guitar (3) Norris, Raffaelle, Sislen

21 Viola (1) Parnas
22 Viola (3) Parnas

23 Cello (1) Martin, Jarvinen
24 Cello (3) Martin, Jarvinen

25 Bass (1) Irvine
26 Bass (3) Irvine

27 Flute (1) Perazzoli, Fuhrman, Kuper
28 Flute (3) Perazzoli, Fuhrman, Kuper

29 Recorder (1) Kraft, Lipnick
30 Recorder (3) Kraft, Lipnick

31 Oboe (1) — R. White
32 Oboe (3) — R. White

33 Clarinet (1) — Wright
34 Clarinet (3) — Wright

35 Saxophone (1) — Wright
36 Saxophone (3) — Wright

37 Bassoon (1) — Lipnick
38 Bassoon (3) — Lipnick

39 French Horn (1) — Ramsay
40 French Horn (3) — Ramsay

41 Trumpet (1) — Recker
42 Trumpet (3) — Recker

43 Trombone (1) — Kraft
44 Trombone (3) — Kraft

45 Percussion (1) — Wardlow
46 Percussion (3) — Wardlow

47 Harp (1) — Seidman
48 Harp (3) — Seidman

49 Tuba (1) — Kraft
50 Tuba (3) — Kraft

51 Orchestra (1) — Steiner

Preparation and performance of orchestral literature. Prerequisite: audition before director. (Fall and spring)

52 Instrumental Ensemble (1) — Steiner

(Formerly two credits)

Chamber ensemble groups approved by audition. (Fall and spring)

53 Chorus (1) — Prussing

Preparation and performance of choral literature. Prerequisite: audition before director.

54 Chamber Choir (1) — Prussing

(Formerly two credits)

Small vocal groups and chorus participation. Prerequisite: audition before director. (Fall and spring)

55 Band (1) — Staff

Concert band, stage band and brass ensemble. (Fall and spring)

Second Group

Departmental prerequisite: Audition to meet departmental requirements.
Required practice: six hours a week for one-semester-hour courses and 12 hours a week for three-semester-hour courses. In addition, three-semester-hour courses include master performance classes and recital preparation.

111 Piano (1) — Staff
112 Piano (3) — Staff

113 Voice (1)	Staff
114 Voice (3)	Staff
115 Organ (1)	Scribner, McNabb, Dobry
116 Organ (3)	Scribner, McNabb, Dobry
117 Orchestral Instrument (1)	Staff
118 Orchestral Instrument (3)	Staff
119 Classical Guitar (1)	Staff
120 Classical Guitar (3)	Staff

Third Group

Required practice: 12 hours a week for three-semester-hour courses and 15 hours a week for six-semester-hour courses. In addition, six-semester-hour courses include supervised ensemble preparation and required concert solo performances.

211 Piano (3)
212 Piano (6)

213 Voice (3)
214 Voice (6)

215 Organ (3)
216 Organ (6)

217 Orchestral Instrument (3)
218 Orchestral Instrument (6)

PATHOLOGY

Professors H. Sidransky *(Chairman)*, F.N. Miller
Associate Professors S.G. Kent, B.C. Zook *(Comparative)*, Y. Al-Doory, F.P. Abramson

Programs of study leading to the degree of *Associate in Science (Medical Laboratory Technique)* are described in the *School of Medicine and Health Sciences Bulletin.*

Master of Science in the field of Anatomic Pathology—Prerequisite: a bachelor's degree from an accredited college or university. The undergraduate program should have included the following: (1) Biology—eight semester hours including four hours of laboratory (this may be either in general biology or zoology but may not include separately credited courses in botany); (2) Chemistry—eight semester hours of general inorganic chemistry, including four semester hours of laboratory, and six semester hours of organic chemistry, including laboratory; (3) Physics—eight semester hours, including at least two hours of laboratory. Courses in embryology, microbiology, histology, genetics, and mathematics are also useful.

Required: the general requirements, pages 89–97. The program of study consists of 39 semester hours of graduate work, including the following: **Anat 202, 203, 204, 205; Path 203–4, 205, 210, 215, 277 and 281.**

Master of Science in the field of Mycology—Prerequisite: a bachelor's degree with a major in biology, botany, chemistry, or zoology from this University, or

an equivalent degree. The undergraduate program should have included the following courses or their equivalent: BiSc 11-12 *Introductory Biology for Science Majors* (4–4); Chem 11–12 *General Chemistry* (4–4), 151–52 *Organic Chemistry* (3–3), 153–54 *Organic Chemistry Laboratory* (1–1).

Required: the general requirements, pages 89–97. Candidates must complete 24 hours of coursework plus 6 hours of thesis (Path 299–300). With the approval of the advisor and the Graduate School, candidates may take 36 hours of coursework without a thesis. Candidates admitted to a non-thesis program are required to take Bioc 222. The remaining academic work must consist of graduate-level courses selected with the approval of the advisor.

Doctor of Philosophy in the field of pathology. Prerequisite: one of the following degrees from a recognized professional school: Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), or Doctor of Dentistry (D.D.S.). In exceptional cases, applicants with other backgrounds in the life sciences may be accepted.

Required: the general requirements, pages 89–91, 97–99, including 48 semester hours of approved graduate course work. One year of experience in pathology at the University Hospital, equivalent to Path 283, may be counted for a maximum of 24 semester hours of graduate course work. Other experience must satisfy the eligibility requirements of the appropriate national certifying body, i.e., the American Board of Pathology in the case of the M.D., the American College of Veterinary Pathologists in the case of the D.V.M. and the American Board of Oral Pathology in the case of the D.D.S.

Research fields: comparative pathology, human pathology, ophthalmic pathology, and veterinary pathology.

Third Group

203–4 Pathology (4–4) — **Staff**

General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 204: Path 203. (Academic year)

*†205 **Comparative Pathology I** (3) — **Zook**

An introduction to the study of disease in vertebrates, comparison with disease in man. Mechanisms by which various agents provoke illness; body defensive reactions. Illustration of common diseases of various species, including material from captive wild animals. Recommended: courses in antomy, histology, and physiology.

†210 **Comparative Pathology Laboratory** (2) — Zook, Montali‡

Participation in an autopsy service involving captive wild animals and comparison of diseases in various anima species with those in man. Limited to 4 students. Path. Lab., Nat'l. Zoological Park. (Fall)

†215 **Perinatal Pathology Laboratory** (2) — **Kent**

Special assignments for dissection and study. (Fall)

220 **Medical Mycology** (2 or 4) — **Al-Doory**

Study of pathogenic fungi, mycotic diseases and their clinical as-

*An interdepartmental course offered by the departments of pathology and biological sciences.
†Open to limited number of graduate students, with permission.
‡Dr. Richard Montali is Assistant Clinical Professor of Pathology at the G.W.U. School of Medicine and Health Sciences.

pects; emphasis on handling of specimens, diagnosis, and identification of etiologic agents. (Fall)

272–73 **Seminars in Mycology** (1–1) Al-Doory

Conferences and discussions on current topics and latest developments in medical mycology. May be repeated for credit. (Academic year)

275 **Research in Mycology** (2 to 4) Al-Doory

Participation in experimental studies in mycotic diseases. Research in laboratory or in community medicine on topics related to mycology. May be repeated for credit. (Fall and spring)

*277 **Anatomic Pathology Clerkship I** (arr.) Staff

A practical course in gross human anatomy and pathology. Prerequisite: Anat 201 or equivalent. Students may spend up to 24 weeks full-time on the necropsy and surgical pathology services, receiving one semester hour of credit for each four-week period. Univ. and V.A. hosps. (Spring)

*281 **Anatomic Pathology Clerkship II** (arr.) Staff

A practical course in gross and microscopic human pathology. Prerequisite: Path 203–4 or equivalent. Students spend up to 24 weeks full-time, or the equivalent part-time, on the necropsy and surgical pathology services, receiving one semester hour of credit for each four-week full-time period. Univ. and V.A. hosps. (Spring)

*283 **Anatomic Pathology Clerkship III** (arr.) Staff

Necropsy and surgical pathology service. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. (Fall or spring)

*295 **Comparative Pathology II** (arr.) Zook, Caseyt, Montali

Participation in veterinary pathology service, including wild and domestic animals. Prerequisite: Path 203-4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Path. Lab Nat'l. Zoological Park, and Armed Forces Inst. of Path. (Fall or spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

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* Open to limited number of graduate students, with permission

† Dr. Harold Wilton Casey is Clinical Professor of Pathology at the G.W.U. School of Medicine and Health Sciences.

PHARMACOLOGY

Professors H.G. Mandel *(Chairman)*, V.H. Cohn, P. Mazel, R. Hertz *(Research)*, S.E. Fabro *(Research)*, J.A. Straw
Professorial Lecturers F.E. Hahn, J. Axelrod, E. Costa, R. Fischer
Associate Professors P. Klubes, F.B. Abramson
Assistant Professors G.S. Edwards, H.C. Harder, A.M. Suria, R.J. Anderson

Master of Science in the field of pharmacology—Prerequisite: a Bachelor of Arts or Bachelor of Science degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11-12; Phys 1, 2; Chem 21-12, 22, 151-52, 153-54. One year of calculus and a course in physical chemistry are also recommended, but these may be taken during the work toward the master's degree.

Required: the general requirements, pages 89-97, including Bioc 221–22; Phyl 201, 212; Phar 203, 205–6, 299–300.

Doctor of Philosophy in the field of pharmacology—Required: the general requirements, pages 89–91, 97–99.

Research fields: biochemical pharmacology, cancer chemotherapy, carcinogenesis, developmental pharmacology, endocrine pharmacology, molecular pharmacology, neuropharmacology, pharmacology of drug abuse, and physiological disposition of drugs.

Second Group

114 **Drugs and the Consumer** (3) Cohn and Staff

General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives, tranquilizers and sleep-inducing drugs, hayfever, headache, and cold remedies; analgesics; antibiotics, vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus tradename drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisites required. Limited enrollment. (Fall)

115 **Drug Abuse Education** (3) Cohn and Staff

Psychological and sociological bases of drug abuse, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems; legal and societal implications of and reactions to drug abuse. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, and hallucinogenic and psychedelic drugs. (Spring)

Third Group

203 **Fundamental Principles of Pharmacology** (3) Cohn and Staff

Basic principles of pharmacology, including drug receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms, drug toxicity. Admission by permission of the instructor. (Fall)

205–6 **Pharmacology** (6-2) Cohn and Staff

Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis of rational disease therapy. Prerequisite:

Phar 203, courses in biochemistry and physiology, or approval of department. Prerequisite to Phar 206: Phar 205. (Fall)

215 **Adolescent Drug Abuse** (3) Cohn and Staff

Offered off campus through the College of General Studies. Primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Mazel and Staff

Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

256 **Molecular Pharmacology** (2 or 3) Hahn

Current theory on drug actions, especially chemotherapeutic agents, at molecular level. Effect of drugs on biosynthetic processes of the cell with respect to DNA, messenger RNA, transfer RNA, ribosomes, protein, cell wall, and intermediary metabolites. Factors which alter action of drugs, such as drug interactions and resistance. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff

Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

260 **Endocrine Pharmacology** (1) Hertz and Staff

Lectures and seminars on recent advances in the pharmacology and mechanisms of action of various hormones. (Spring, odd years)

267 **Pharmacological Research** (arr.) Staff

Research with staff members. May be repeated once for credit toward a Master of Science degree. (Fall and spring)

269 **Pharmacology Seminar** (1) Mazel and Staff

Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

272 **Physiological Disposition of Drugs** (3) Cohn

Fate of drugs in biological tissue. Absorption, distribution, chemical alteration, excretion of drugs; physical, chemical, and biological factors affecting these processes. Prerequisite: Phar 205 6 or permission of the instructor. (Spring, even years)

275–76 **Advanced Topics in Pharmacology I-II** (1–1) Edwards and Staff

Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Academic year 1977–78 and alternate years)

277–78 **Advanced Topics in Pharmacology III-IV** (1–1) Edwards and Staff

Continuation of Phar 275–76. (Academic year 1978–79 and alternate years)

279 **Special Topics in Pharmacology** (arr.) **Staff**
Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) **Suria and Staff**
Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205-6 or equivalent. (Spring, odd years)

295 **Reading and Research** (arr.) **Staff**
Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHILOSOPHY

Professors T.Z. Lavine, R.H. Schlagel *(Chairman)*
Associate Professors C.H. Pfuntner, W.B. Griffith, R.S. French
Assistant Professor R.P. Churchill

Bachelor of Arts with a major in Philosophy (Departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social studies and the natural and mathematical sciences.)
2. Required courses in related areas: six semester hours of literature courses selected from Chinese, Classics, English, French, German, Italian, Slavic or Spanish (Clas 71, 72, or Engl 191-92 recommended); six hours selected from art history, music history or religion; six hours in history (Hist 39-40 recommended).
3. Required courses in the major—Phil 111, 112, 113; nine semester hours selected from Phil 121, 131, 151, 152, 198, six semester hours selected from Phil 172, 192, 193; plus six additional semester hours of second-group philosophy courses.

For students expecting to continue in graduate school, it is recommended that they include in their program of study 12 semester hours of introductory French, German or Greek language courses.

Master of Arts in the field of Philosophy- Prerequisite: a bachelor's degree

with an undergraduate major in philosophy at this University, or an equivalent degree. The undergraduate program should have included the following courses or their equivalent: Phil 111, 112, 113, 121, 131, and 152.

Required: the general requirements, pages 89–97. The program of study consists of a minimum of 30 semester hours of second- and third-group courses with or without a thesis. A Master's Comprehensive Examination is required in two areas of philosophy: the history of philosophy; problems of philosophy and contemporary philosophy. Candidates must pass a reading knowledge examination in French, German or Greek.

Master of Arts in Special Studies with an area of concentration in Philosophy and Social Policy. An interdisciplinary program which brings the normative, historical, and analytical-logical skills of philosophical inquiry to bear upon contemporary problems of social policy. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requireemnts, pages 89–97. Two options are available: (1) a minimum of 24 semester-hours of approved graduate course work plus the successful completion of a thesis, or (2) a minimum of 36 semester-hours of graduate course work which does not include a thesis. Phil 195, 198, 231, and 272 are required for all students. Phil 299 300 is required for students electing to write a thesis. The remainder of the course work in both options must include a majority of approved courses in the arts and sciences, with no more than one-third taken in any one department. Other courses may be selected from Chinese, Classics, English, French, German, Italian, Slavic or selected from the School of Education, School of Government and Business Administration, and School of Public and International Affairs. Each candidate must pass a Master's Comprehensive Examination based on the particular interdisciplinary composition of the student's program of study. Prospective candidates should consult Professor Roderick French, director of the program.

First Group

45 Introduction to Logic (3) **Churchill**
(Formerly Phil 101, Logic, Scientific Inference, and Legal Argument)
Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic. (Spring)

50 Introduction to Philosophy (3) **Staff**
Readings from major philosophers and study of philosophic positions from Plato to the present. (Fall and spring)

71 Philosophy and Literature (3) **Levine**
Philosophical foundations of psychoanalytical psychiatry, existentialism, and Marxism and their expression in literature, e.g., in the works of Mann, Kafka, Camus, Sartre, Hesse, Gide, and Koestler. (Spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

* An interdepartmental course offered by the Philosophy, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion Departments.

Second Group

111 **History of Ancient Philosophy** (3) — Pfuntner

History of Western philosophy from early Greece to the early Middle ages. (Fall)

112 **History of Modern Philosophy** (3) — Churchill

History of Western philosophy of the 17th and 18th centuries (Descartes to Kant). (Spring)

113 **19th Century Philosophy** (3) — Lavine

European philosophy from Kant to German Romanticism, Fichte, Hegel, Kierkegaard, Schopenhauer, and Nietzsche. (Fall)

121 **Symbolic Logic** (3) — Griffith

(Formerly Intoduction to Symbolic Logic)

Systematic study of the principles of valid inference with attention to the development of skill in logical analysis and evaluation of arguments, and to the elementary theory of formal systems. (Fall)

*127 **Theories of History** (3) — Lavine

Major philosophies of history: Judeo-Christian, linear progressive, historicist, Hegelian-Marxian dialectical, cyclical (Vico, Spengler, Toynbee), and social-scientific (Comte, Weber). Contemporary problems of historical knowledge. (Fall)

131 **Ethics** (3) — Griffith

Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems. (Spring)

132 **Social Philosophy** (3) — Lavine, Churchill

Social philosophies from Locke to contemporary theorists. (Spring)

133 **Philosophy, Nonviolence, and the Problem of War** (3) — Churchill

Problems of war in relation to morality; theories of human aggression and violence; nonviolence and pacificism as alternatives to war; doctrine of just war. (Summer)

142 **Philosophy of Law** (3) — Churchill

Systematic examination of fundamental concepts of law and jurisprudence; special emphasis on the relationship between law and morality.

151 **Myth, Science and the Modern Mind** (3) — Schlagel

Comparison of the mythical and scientific outlook; emphasis on the development and nature of scientific concepts, methodology, and explanation from Copernicus to Einstein. (Fall)

152 **Knowledge, Truth and Reality** (3) — Schlagel

Inquiry into the basis and structure of knowledge, the problem of perception and independent reality, and the meaning and criteria of truth. (Spring)

* An interdepartmental course offered by the Philosophy and History Departments.

162 Aesthetics (3) **Pfuntner**
Nature of aesthetic experience, problems of appreciation and criticism in the arts, and theories of artistic creation. (Spring)

172 American Philosophy (3) **Pfuntner**
Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought. (Fall)

192 Contemporary Philosophy: Analytical (3) **Schlagel**
The two dominant movements of recent Anglo-American philosophy, logical positivism and British ordinary language philosophy, as represented by Russell, G. E. Moore, Wittgenstein, Ryle, Ayer, etc. (Fall)

193 Contemporary Philosophy: Phenomenological (3) **Staff**
The phenomenological movement, including its development into German and French existentialism, and its more recent phases. (Fall)

195 Man and Nature in Public Policy (3) **French**
Relation of philosophical conceptions of man and nature to national policies of growth and development in selected periods of American history. (Fall)

198 Philosophy of the Social Sciences (3) **Lavine**
Philosophic issues relating to theory, methodology, and application of the social sciences. Analysis of one major contemporary social scientific project. (Spring)

Third Group

201–2 Readings and Research (3–3) **Staff**
Advanced readings and reports. Investigation of special problems. (Academic year)

216 Seminar: Kant (3) **Schlagel**
Critique of Pure Reason.

221 Seminar: Logic of Choice (3) **Griffith**
(Formerly Seminar: Logical Theory)
Tools of formal logic applied to analysis and evaluation of arguments justifying choices, both individual (optimality arguments) and collective (decision rules). (Spring)

231 Ethics and Economic Policy: Justice and Equality (3) **Griffith**
Economic policy viewed from the perspectives of ethical and economic theories with special focus upon the issue of income distribution in the United States. (Fall)

251 Seminar: Philosophy of Science (3) **Schlagel**
Selected problems in the historical and theoretical foundations of science.

252 Seminar: Epistemology (3) **Schlagel**
Selected problems

272 **Pragmatic Naturalism and American Social Policy** (3) Pfuntner
Examination of pragmatic naturalism as a criticism and reconstruction of American institutions. Evaluation of philosophical and theological alternatives to naturalism in the face of current technological and ecological problems. (Spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

PHYSICAL SCIENCE

See **Chemistry.**

PHYSICS

Professors H.H. Hobbs, J. Eisenstein, O. Bergmann, A.J. Zuchelli, F. Prats
Associate Professors W.C. Parke, N.K. Khatcheressian *(Chairman)*, D.R. Lehman
Assistant Professor M.F. Taragin

Bachelor of Arts or Bachelor of Science with a major in Physics (Departmental)—**The following requirements must be fulfilled:**
1. The general requirements as stated on pages 73-74, 80-86.
2. Prerequisite courses—Phys 3, 14, 15, 16; Chem 11 12; Math 31, 32, 33.
3. **Required course in related area—Stat 97 or EE 51.**
4. Required courses in the major—Phys 151, 161, 162, 163, 164, 165–66, 167, 168.

Master of Arts in the field of physics—Prerequisite: a bachelor's degree with a major in physics at this University, or an equivalent degree.

Required: the general requirements, pages 89-97, and 30 semester-hours of coursework in physics, including Phys 231, 232, 233 34, 235, 236, 299 300, plus **one of the following: Phys 241, 243, 244, 245, or 251–52.**

A reading knowledge of a foreign language, or the successful completion of Stat **197, with a grade of *A* or *B*, is required.**

Doctor of Philosophy in the field of physics—Required: the general requirements, pages 89-91, 97–99, and the successful completion of one of the two following tool requirement options: (a) two foreign language reading examinations or (b) one foreign language reading examination and completion of Stat **197 with a grade of *A* or *B*.**

Research fields: experimental solid state physics (electrical conductivity of solids, defects in crystals, magnetic properties of solids at low temperatures, magnetic resonance, Mossbauer effect, superconductivity), and theoretical physics (elementary particles, field theory, general relativity, magnetic and optical properties of solids, molecular structure, nuclear and photonuclear reactions).

Bachelor of Arts in Education with a teaching field in physics—Prerequisite: **the education curriculum, pages 111–12.**

Required: the physics option and the professional courses listed on pages 115–16.

Departmental Prerequisite: Phys 3, 14, 15, 16; two semesters of calculus or equivalent; and consent of a departmental advisor are prerequisite to all **second-group courses.**

Undergraduate departmental advisors: W. Parke, D. Lehman, N. Khatcheressian, M. Taragin

Graduate departmental advisors: H. H. Hobbs, J. Eisenstein, O. Bergmann, A. J. Zuchelli, F. Prats

ASTRONOMY

First Group

9–10 Introduction to Astronomy (3–3) — Hobbs

Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $11 a semester. (Academic year)

11–12 Introduction to Astronomy (2–2) — Hobbs

Same as Phys 9–10 without the laboratory. (Academic year)

21 Modern Cosmology (3) — Staff

Nonmathematical treatment of cosmology and related subjects from astronomy and physics. Quasars, peculiar galaxies, pulsars, black holes, antimatter, etc. Prerequisite: Phys 10 or 12.

PHYSICS

First Group

1 Foundations of Physics (4) — Parke

Lecture (2 hours), recitation (1 hour), laboratory (2 and one-half hours). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat and electromagnetism, including the classical concepts of energy, momentum, heat, temperature, entropy, electric and magnetic fields, optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. Laboratory fee, $18.

2 Introduction to Modern Physics (4) — Zuchelli

Lecture (2 hours), recitation (1 hour), laboratory (2 and one-half hours. Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of length and time in relativity theory, present understanding of gravitation, wave-particle duality, quantum theory, nuclei, subnuclear particles. Prerequisite: Phys 1 or equivalent. Laboratory fee, $18.

3 Foundations of Physics (3) — Parke

Same as Phys 1 without laboratory.

***4 Introduction to Modern Physics** (3) — Zuchelli

Same as Phys 2 without laboratory.

* This course may not be taken by students who have completed, or are enrolled in or plan to enroll in Phys 2.

6 Energy and the Environment (3) Lehman

Consideration of energy resources and their utilizational impact on the environment from a physical viewpoint. Topics include: the demand for energy, the cost of energy, nuclear fission-radiation hazard to humans, pollution due to energy sources, transportation of energy and waste, and energy converters. Prerequisite: high school algebra.

14 Introductory Mechanics and Thermal Physics (3) Khatcheressian

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18. (Spring)

15 Elements of Electricity and Magnetism (3) Taragin

Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss' Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18. (Fall)

16 Introduction to Modern Physics (3) Lehman

Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of quantum theory. Topics include wave-particle duality, the hydrogen atom, Pauli's exclusion principle, x-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $18. (Spring)

27–28 Physics in Medicine (3–3) Parke

Principles of physics applied to biological systems and to medical instrumentation, including ultrasonics, circulation dynamics, bioenergetics, optics in medicine, applications of IR and UV radiation, medical transducers, particle radiation in medicine, models of the brain, molecular biophysics. Prerequisite: Phys 2 or equivalent.

Second Group

151 Intermediate Research (3) Taragin

Independent advanced work to introduce students to research techniques and use of specialized instruments. Laboratory fee, $11 a semester. (Academic year)

161 Mechanics I (3) Prats

Mechanics of mass points and rigid bodies. Newton's laws, conservation laws, Euler's equations, inertia tensor, small vibrations, and elements of Lagrange's and Hamilton's equations.

162 Mechanics II (3) Prats

Basic aspect of continua, including elasticity and fluid dynamics,

strain tensor, stress tensor, equations of equilibrium, elastic waves, ideal and viscous fluids.

163 **Physical and Quantum Optics** (3) Eisenstein, Hobbs

Oscillations and waves, energy and momentum of the electromagnetic field, interference, diffraction, geometrical optics, optics of crystals and other media, dispersion.

164 **Thermodynamics** (3) Taragin

Principles and applications of equilibrium thermodynamics, reversible processes, thermodynamic potentials, stability and phase changes.

165–66 **Electromagnetic Theory** (3–3) Lehman, Eisenstein

Development of Maxwell's field equations using vector and tensor calculus, electrostatics, stationary and nonstationary phenomena, basic circuit theory, electronmagnetic waves and radiation.

167 **Principles of Quantum Physics** (3) Khatcheressian

Development of logical structure and experimental bases for modern quantum mechanics. Simple examples worked out to clarify the structure; primary emphasis on conceptual framework and its mathematical realization; careful consideration of the laboratory results to which the theory is a response.

168 **Applied Quantum Physics** (3) Parke, Zuchelli

Explicit applications of principles of quantum mechanics to a variety of problems in atomic, molecular and nuclear physics. Quantum statistical mechanics developed with applications in solid state. Emphasis on explicit evaluation of solutions and the techniques required. Prerequisite: Phys 167 or equivalent.

170 **Elementary Solid State Physics** (3) Khatcheressian

Structure of solids, lattices and lattice defects, deformation, vibrational and electronic contribution to specific heats, binding energies, electronic states in metals and semiconductors, magnetic properties of solids. Elementary methods required such as quantum mechanics and normal mode expansions are developed as needed.

175 **Nuclear Physics** (3) Lehman, Prats

Introduction to application of quantum physics in the description of nuclei and their interactions. Properties of nuclei, nuclear models, nuclear forces, and nuclear reactions are considered. Specific topics include the deuteron, n-p scattering, the optical model, the shell model, the liquid-drop model, beta-decay, fission, and fusion. Prerequisite: Phys 167 or permission of instructor.

Third Group

Consent of a departmental graduate adviser is required for admission to all third-group courses in Physics.

231 **Electromagnetic Theory: Macroscopic Effects** (3) Eisenstein

Detailed consideration of classical electromagnetic field theory in vacuum and in electrically and magnetically active media. Boundary-value problems, multipole expansions, induced polarizations, time-dependent fields, frame dependence of the fields, gauge transformations, radiation fields.

232 **Advanced Mechanics** (3) Zuchelli

Analytic methods of mechanics as a basis for modern theory: variational principles, Lagrange's equations, Hamiltonian formulation, canonical transformations, classical perturbation theory.

233–34 **Quantum Mechanics** (3–3) Prats

General aspects of quantum mechanics with emphasis upon the developmental principles involved. Operators, representations and transformation theory. Schrödinger and Heisenberg pictures, angular momentum, perturbation theory, scattering theory. (Academic year)

235 **Special Relativity** (3) Bergmann

Application of relativistic concepts to the basic fields of physics: space and time, tensors and covariant mechanics of point particles, covariant form of electromagnetism, relativistic variational principles, relativistic quantum equations.

236 **Electromagnetic Theory: Electrodynamics and Radiative Effects** (3) Bergmann, Eisenstein

Analysis of problems involved in obtaining the motion of charges in given electromagnetic fields and radiation from such charges. Covariant methods developed and used where suitable. Specific topics include radiation by moving charges, spectral decomposition and integrated flux, angular distribution of radiation, radiation reaction and anomalies.

241 **Statistical Mechanics** (3) Lehman, Bergmann

Study of classical and quantum equilibrium statistical mechanics. Kinetic theory and transport phenomena reviewed prior to examining principles of statistical mechanics. Among topics considered: distribution functions, H-theorems, partition functions, Gibb's paradox, canonical ensemble, grand canonical ensemble, ideal gases, interacting gases, cluster expansion, virial expansion, and density matrices.

242 **Atomic and Molecular Structure** (3) Bergmann

Structure of atoms and molecules, energy levels, binding energy, optical activity. Hartree and Hartree-Fock equations, spin-effects, rotational and vibrational effects, para-magnetic resonance, chemical binding.

243 **Solid State Physics: Structure and Binding** (3) Khatcheressian, Hobbs, Taragin

Atomic structure of solids and analysis of the binding of crystals. Crystalline forms and symmetries, atomic vibrations and specific heats, sound and optical propagation, crystalline defects.

244 **Solid State Physics: Electronic Processes in Metals** (3) Khatcheressian, Eisenstein

Phenomena in metals and semi-conductors determined by the electronic states allowed: binding, specific heats, magnetic properties, transport phenomena. Independent particle approximation and many-body aspects are discussed.

245 Quantum Electrodynamics: Theory and Applications (3) Zuchelli
A presentation of the lower order effects depending upon the quantal nature of the electromagnetic field: Hamiltonian formulation and field quantization, perturbation calculations, Compton effect, photoelectric effect, electron-electron scattering, pair creation and annihilation, indices of refraction, divergence difficulties.

246 Quantum Field Theory (3) Bergmann
Covariant presentation of general theory of quantized fields, Boson and Fermion fields, theory of S-matrix, dispersion relations, and renormalization program.

247 Nuclear Theory (3) Prats, Lehman
Nuclear interactions, nuclear models, theory of nuclear reactions, pion physics and weak interactions.

248 Elementary Particles (3) Parke
Experimental properties and present theoretical understanding of sub-nuclear particles; applied S-matrix formalism; symmetry principles; unified models, and theories of weak, electromagnetic, and strong interactions.

249 Statistical Processes (3) Zuchelli
Analysis of problems involved in understanding and predicting the approach to equilibrium of a complex system within the classical context, as exemplified by rare or dense gases, ionized gases, or plasmas. Specific topics include Liouville equation, ergodic theory, Boltzmann equation, Boltzmann-Vlasov equation, Chapman-Enskog theory, Bogoliubov time scales, Prigogine type formalism, convergence questions.

250 Selected Topics in Modern Physics (3) Staff
Possible topics include nuclear three-body problem; group theory and symmetry principles in physics; differential manifolds applied to physics; electric states and superconductivity; gauge field theories; dispersion relations and unitarity in scattering theory. May be repeated for credit with permission of graduate advisor. (Fall and spring)

251–52 Laboratory (3–3) Staff
Individual work on special topics. Laboratory fee, $15 a semester. (Academic year)

254 General Theory of Relativity (3) Bergmann
Physical principles and mathematical methods underlying Einstein's field equation, geodesic equations of motion, checks of the theory, action principle, conservation laws, perturbation theory, gravitational radiation theory, relativistic cosmology. Offered on demand.

291 Seminar (1) Staff
Lectures on special problems in physics. May be repeated once for credit. (Fall and spring)

299–300 Thesis Research (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated once for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHYSIOLOGY

Professors C.S. Tidball, R.A. Kenney *(Chairman)*, M.E. Tidball, M.M. Cassidy
Associate Professors M.J. Jackson, R.A. Lavine, D.W. Watkins
Assistant Professor M. Frank

Master of Science in the field of Physiology—Prerequisite: a bachelor's degree. No major is specified, but the undergraduate program must have included the following courses or their equivalents: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Math 31; Phys 1, 2.

Required: the general requirements, pages 89–97. In addition to the thesis, the 30 hours of required work should include Phyl 201, 221, 298, and at least three semester hours of research (Phyl 295).

Doctor of Philosophy in the field of Physiology—Required: the general requirements, pages 89–91, 97–99. The program of study includes a major field in physiology, a subfield (see below) in physiology and a minor field outside of physiology leading to the Cumulative Examination. The 48 semester hours of required course work leading to the Cumulative Examination should include Bioc 221–22; Phyl 201, 221, 298, 396, 397; and a minimum of eight semester hours each in two areas outside of Physiology in addition to the minor field.

Research fields and areas of study: applied physiology, cardiovascular physiology, cellular physiology, endocrine physiology, gastrointestinal physiology, neurophysiology, renal physiology and respiratory physiology.

Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201.

Second Group

191 **Selected Topics in Human Structure and Function** (3) Kenney

Lecture (2 hours), laboratory (1 hour). Structural and functional basis of physiology. Though an undergraduate course, this is required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11 12 or equivalent and consent of instructor. Open to Columbian College of Arts and Sciences students with the approval of the student's major advisor. (Fall)

Third Group

201 **Physiology** (8) **Staff**

Lecture (8 hours), laboratory (2 hours), conference (1 hour). Cellular,

organ system, and applied mammalian physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 201 or 221 22 (Bioc 222 may be taken concurrently); or consent of chairman of department. Open to Consortium students only with permission of department chairman. (Spring)

212 **Neurobiology** (3) (Same as Anat 212) Staff

An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstrations, and laboratory. Laboratory fee, $25.

221 **Seminar** (1) Cassidy

Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

*223–24 **Biomedical Instrumentation** (4–4) Staff

Same as Bioc 225 26 and Micr 240 41. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification and quantification of materials of interest to biomedical and forensic scientists. Laboratory fee, $50. (Academic year)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy

Discussion on principles of fluid and acid-base balance and the application of these principles to scientific situations. (Fall)

261 **Gastrointestinal Physiology** (1 or 2) Jackson, Dobbins†

Weekly seminar: role of basic sciences in gastroenterology: intra- and extra-mural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney

Survey, at an advanced level, of aspects of cardiovascular physiology especially as interrelated with the respiratory and renal systems. (Fall)

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine

Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior and sensory processing. Open to students in the School of Engineering and Applied Science with permission of instructor. (Fall)

270 **Computer Utilization in Physiology and Medicine** (3) C. Tidball
(Formerly Phyl 268 [2])

Lecture one hour a week, practical experience at student's convenience. Orientation to processing analog and digital signals on mini-computers. Programming in assembly language as well as a high-level language of the student's choice. No previous computer experience necessary. (Fall)

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* An interdisciplinary course offered by the Biochemistry, Microbiology and Physiology Departments.

† Dr. W. O. Dobbins III is Professor of Medicine, School of Medicine and Health Sciences.

271 **Computer Simulation of Physiological Processes** (3) C. Tidball
Lecture 1 hour a week; practical experience at student's convenience. Programming of physiological simulation will be learned by writing a series of simulations of increasing complexity. Prerequisite: Phyl 270 or equivalent or permission of instructor.

272 **Reading and Research in Simulation of Physiological Processes** (3) C. Tidball
Readings in physiological simulations and their evaluation. Informal discussions at regular intervals. Prerequisite: Phyl 271 or equivalent or permission of instructor. May be repeated once for credit.

295 **Research** (arr.) Staff
By special arrangement with individual staff members. Approximately four clock hours in the laboratory for each semester hour of credit. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

298 **Comprehensive Physiology** (arr.) Staff
Guided review of selected areas of physiology appropriate to the student's graduate program. This course satisfies the requirements for the Master's Comprehensive Examination, the Field Examination for doctoral students minoring in physiology, and Part I of the Cumulative General Examination. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

396 **Advanced Reading and Research** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of Physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in Physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problems. This course satisfies the requirement for Part III of the Cumulative General Examination in Physiology. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

POLISH

See **Slavic Languages and Literatures.**

POLITICAL SCIENCE

Professors R.E. Purcell, H.L. LeBlanc, B. Nimer, A. Gyorgy, H.C. Hinton, B.M. Sapin, J.A. Morgan, Jr., B. Reich *(Chairman)*, Y.C. Kim
Professorial Lecturer **J.F.C. Hyde, Jr.**
Associate Professors C.F. Elliott, C.A. Linden, S.J. Wayne, J.M. Logsdon, H.R. Nau
Adjunct Associate Professor D. Robinson
Assistant Professors R.E. Darcy, J.M. Starrels, S.W. Burks, R.L. Cole, D. Fischer, E.R. Declercq, G.C. Mackenzie, S. Shaffer, C. McClintock

Bachelor of Arts with a major in political science (departmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 73–74, 80–86.

2. Prerequisite: two courses selected from PSc 1, 2, and 3. Twelve semester hours of introductory foreign language courses are recommended for students interested in political theory, comparative government, or international relations. Courses in statistics are strongly recommended for students interested in American government or public policy and for those anticipating graduate study in political science.

3. Required courses in the major: 30 semester hours of second-group political science courses, including a distribution requirement which consists of three semester hours from each of the following groups: Group A (political theory and methodology)—PSc 101, 102, 105, 106, 107, 108, 109, 110. Group B (American government and politics)—PSc 111, 112, 113, 114, 115, 116, 118, 119, 120, 121. Group C (comparative government and politics)—PSc 130, 131, 146, 165, 168, 170, 173, 177, 179, 180, 181, 183. Group D (international politics, law, and organizations)—PSc 140, 142, 144, 149, 178, 182, 184. Group E (public policy)—PSc 104, 112, 117, 122, 124.

Up to 12 hours of either service-learning courses or internships with their associated seminars may be credited toward a degree. No more than six hours of such courses may be credited toward the major, and they do not satisfy the distribution requirement.

Students in the 90-semester-hour degree program (see page 82) must receive grades of *A* in at least 18 semester hours of second-group political science courses.

Students may apply for graduation with Special Honors. To qualify, a student must fulfill the general requirements (see page 51) and take at least one political science honors seminar in which an independent study project is completed with distinction. A departmental committee will review the project and make a recommendation for graduation with Special Honors.

***Master of Arts in the field of political science*—Prerequisite:** a bachelor's degree with a major in political science from an accredited college or university, or an equivalent degree, and high undergraduate scholastic standing.

Required: The general requirements, pages 89–97, and a reading knowledge of a modern foreign language or a specified level of knowledge in statistics. The choice of a foreign language, or of statistics in lieu of a language, must be made with the approval of the department. Students may elect one of the following programs: (1) 24 semester hours of graduate coursework, plus a thesis (equivalent to six semester hours), and the satisfactory completion of a Master's Comprehensive Examination in three subfields selected from those listed under the Ph.D. program; or (2) 33 semester hours of graduate coursework without a thesis and the satisfactory completion of a Master's Comprehensive Examination in four subfields, at least two of which must be selected from those listed under the Ph.D. program.

PSc 200 is required of all students during the first semester of graduate study unless they demonstrate knowledge of the course's subject matter by passing a waiver examination.

Doctor of Philosophy in the field of political science. Students of outstanding ability are admitted to the doctoral program upon recommendation of a departmental graduate committee and the concurrence of the dean of the Graduate School of Arts and Sciences.

Required: The general requirements, pages 89–91, 97–99, and a reading knowledge of two modern foreign languages, or a reading, writing, and speaking proficiency in one modern foreign language, or a reading knowledge of one modern foreign language and a specified level of knowledge in statistics. In addition, each student must complete a General Examination, which covers a major and minor field of study.

PSc 200 and 201 are required of all students unless they demonstrate knowledge of the courses' subject matter by passing a waiver examination.

Each student must choose a major and minor field of study from four principal subject-matter divisions. Each subject-matter division has several subfields of study from which the student, in consultation with an advisor, constructs a program. A major field of study consists of three subfields; a minor field of study consists of two subfields.

The subject-matter divisions and their subfields are (1) theory and methodology (analysis of Western political thought, analysis of Marxist and Marxist-Leninist thought, and scope and methods of political science); (2) comparative and foreign politics (comparative political analysis, regional comparative politics, and domestic politics of a specified major political system); (3) international relations (international politics, international law, regional international relations, and foreign relations of a specified major political system); and (4) American politics (American political process, national policy-making process, American constitutional law and judicial process, and state, local, and urban politics). Quantitative political analysis may be used as a subfield in any of the subject-matter divisions.

Departmental prerequisite: Two courses selected from PSc 1, 2, or 3 are prerequisite to all second-group courses in political science and service-learning political science.

First Group

1 Introduction to Comparative and International Politics (3) — Gyorgy
(Formerly PSc 5 Introduction to Political Science)
Comparative political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies. (Fall and spring)

2 Introduction to American Politics and Government (3) — Purcell, LeBlanc, Wayne, Cole
(Formerly PSc 6 Introduction to Political Science)
Structure, powers, and processes of the American political system. (Fall and spring)

3 Introduction to Political Behavior (3) — Darcy
(Formerly PSc 4 Introduction to Political Science)
Study of political behavior, including the role of politics in today's world, the sources of elite and mass political behavior, and the influence and nature of political institutions. (Fall)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Scope and Methods of Political Science** (3) Kim, Darcy, Cole, Declercq, Shaffer
(Formerly PSc 105)
Nature of political inquiry, approaches to the study of politics and government, empirical methods of research. (Fall and spring)

102 **Empirical Political Analysis** (3) Darcy, Cole, Declercq, Shaffer
(Formerly PSc 109)
Extensive examination of empirical research methods in the analysis of political behavior. Research design, data collection (survey and aggregate), and data analysis. Prerequisite: PSc 101 or permission of instructor. (Spring)

104 **Methods of Public Policy Analysis** (3) Declercq
(Formerly PSc 196)
Models and case studies of public policy formation and changes, techniques of policy analysis and evaluation, normative implications of alternative policy-making frameworks. (Spring)

105 **Political Theory: Major Issues of Western Political Thought I** (3) Linden, Fischer
(Formerly PSc 117)
Foundations of Western political thought—Plato to Aquinas. (Fall)

106 **Political Theory: Major Issues of Western Political Thought II** (3) Linden, Fischer
(Formerly PSc 118)
Philosophical roots of modern political order and disorder—Machiavelli to Rousseau. (Spring)

107 **Issues in Modern Political Thought** (3) Linden
Issues of modern political thought as seen through major representative thinkers. Emphasis on conservative, liberal, and radical thought. (Summer)

108 **Modern Communist Ideologies** (3) Elliott
(Formerly PSc 160)
Intensive study of theories and philosophical assumptions of modern communism. Emphasis on the careers and ideas of leading figures: Marx, Engels, Lenin, Stalin, Khrushchev, and Mao. (Fall)

109 **Democratic Theory** (3) Staff
Issues of recent democratic thought and theory, particularly in relation to the contemporary American political process. (Fall)

* An interdepartmental course offered by the Political Science, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Religion Departments.

110 American Political Thought (3) Staff
(Formerly PSc 119–20)
Political thought in the U. S. from colonial times to the present as seen through major representative writings. (Spring)

111 State and Urban Politics (3) Burks, Cole, Declercq
(Formerly PSc 103 State Politics)
Comparative analysis of context, institutions, processes, and policies of state and urban political systems. (Fall)

112 State and Urban Policy Problems (3) Burks, Cole, Declercq
(Formerly PSc 104 Urban Politics)
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings. (Spring)

113 Policy and Politics of Intergovernmental Relations (3) Burks, Cole
Analysis of relationships among national, state, and local governments. Emphasis on the policy consequences of intergovernmental relations and the emerging federal system. (Fall)

114 U.S. Constitutional Law and Politics I (3) Morgan
(Formerly PSc 121)
Separation of powers, federal-state relationships, economic regulation. (Fall)

115 U.S. Constitutional Law and Politics II (3) Morgan
(Formerly PSc 122)
Political and civil rights. (Spring)

116 The American Presidency (3) Wayne
(Formerly PSc 126)
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance. (Fall and spring)

117 Public Administration and Bureaucratic Politics (3) Declercq
(Formerly PSc 151 Public Administration and Public Policy-making)
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation. (Spring)

118 Legislative Process (3) Mackenzie
(Formerly PSc 125)
Study of Congress, including theories of representation, legislative power structure, selection of legislators and the roles they play, decision-making, and the relationship between the legislative and executive branches. (Fall and spring)

119 U. S. Political Parties and Politics (3) LeBlanc
(Formerly PSc 145)
Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches. (Fall and spring)

120 **Public Opinion and Political Socialization** (3) Darcy
(Formerly PSc 146)
Sources of mass political attitudes and behavior; voting and political campaigning. (Spring)

121 **Politics and Social Change in America** (3) Burks
(Formerly PSc 106)
Patterns of power and influence in American society; ideology and change; limits of institutional reform; interest groups and social movements; role of protest and violence. (Fall)

122 **Science, Technology and Politics** (3) Logsdon, Teich
(Formerly PSc 108)
Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use and control of science and technology. (Fall and spring)

124 **Issues in Domestic Public Policy** (3) Burks, Cole, Declercq
Current status of governmental programs dealing with various social problems in such areas as health, crime, poverty, education and transportation. (Fall or spring)

130 **Comparative Government and Politics** (3) Kim, Starrels, McClintock
(Formerly PSc 111)
Comparative political analysis with primary focus on the principal states of Western Europe. (Fall and spring)

131 **Comparative Government and Politics** (3) Gyorgy, Hinton, Elliott
(Formerly PSc 112)
Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe. (Fall and spring)

140 **International Politics** (3) Nau, Starrels, Shaffer
(Formerly PSc 171)
International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy. (Fall and spring)

142 **International Organizations** (3) Nau, Stambuk
(Formerly PSc 172)
Development and operations of the United Nations, regional organizations, and functional international organizations. (Fall and spring)

144 **Public International Law and Organization** (3) Fischer
(Formerly PSc 181)
Survey of international law; emphasis on development and trends. (Fall and spring)

146 **U. S. Foreign Policy** (3) Purcell
(Formerly PSc 167)
Constitutional, political, and international factors that determine the formulation execution, and substance of U.S. foreign policy. (Fall and spring)

149 **Military Force and Foreign Policy** (3) Sapin
Impact of military considerations on U.S. foreign policy; major problems in national security, e.g., strategic weaponry, military assistance, regional security problems. (Spring)

165 **Government and Politics in Eastern Europe** (3) Gyorgy
(Formerly PSc 115)
Study of the contemporary social and ethnic structures, governmental systems, and international position of the Eastern European states within the Soviet system. (Summer)

168 **Soviet Foreign Policy** (3) Elliott
(Formerly PSc 163)
Relations with U. S., Europe, Third World, China; international communism; instruments of foreign policy; interrelationships between domestic and foreign policies; ideology and foreign policy. (Fall)

170 **Governments and Politics of China and Japan** (3) Hinton
(Formerly PSc 162 Government and Politics of China)
Political institutions and processes of China since 1949 and of Japan since 1945. Influence of indigenous traditions and foreign contacts. (Fall)

173 **Governments and Politics of South and Southeast Asia** (3) Hinton
(Formerly PSc 193)
Domestic and international politics of the area's major states. (Spring)

177 **Governments and Politics of the Middle East** (3) Reich
(Formerly PSc 191)
Politics of the eastern Arab states, Turkey, Iran, Israel. (Spring, even years)

178 **International Relations of the Middle East** (3) Reich
(Formerly PSc 179)
Analysis of the regional and international relations of the Middle East. (Fall)

179 **Israeli Foreign Policy** (3) Reich
(Formerly PSc 180)
Examination of the institutions, processes, and issues of Israeli foreign policy. (Spring)

180 **Governments and Politics of North Africa** (3) Reich
(Formerly PSc 192)
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East. (Spring, odd years)

181 **Politics of Middle and Southern Africa** (3) Nimer
(Formerly PSc 190)
Comparative analysis of political systems in selected countries of non-Mediterranean Africa. (Fall)

182 **African International Politics** (3) Nimer
(Formerly PSc 189)
Analysis of interstate relations in Africa and of selected aspects of African relations with the outside world. Recommended prerequisite: PSc 181 or equivalent. (Spring)

183 **Governments and Politics of Latin America** (3) McClintock
(Formerly PSc 177)
Political processes and institutions in Latin America; emphasis on Argentina, Brazil, Chile, and Mexico. (Fall)

184 **International Relations of Latin America** (3) McClintock
(Formerly PSc 178)
U. S.-Latin American relations, inter-American diplomacy and organization, foreign policies of selected states, the Cuban revolution. (Spring)

*186 **Internship: Congressional Politics** (3 or 6) Robinson
(Formerly PSc 149–50)
Study of the legislative process through readings on the structure and process of the U.S. Congress and work in a congressional office or committee. (Fall and spring)

*187 **Internship: Political Behavior** (3 or 6) Mackenzie
(Formerly SPSc 155 American Political Behavior)
Internship with a variety of interest groups and, during election years, political campaigns. Analysis of the structural and behavioral limitations which confront those who wish to exercise political influence. (Fall and spring)

*188 **Internship: Urban Affairs** (3 or 6) Burks
(Formerly PSc 185–86 Apprenticeship in Urban Affairs)
Study of urban political and policy-making processes through assignment to an urban-related political or governmental office. Primarily for senior urban affairs majors. (Fall and spring)

*189 **Internship: Legal Process** (3 or 6) Williams
(Formerly SPSc 154 Law and Social Change)
The legal system and its role in promoting social change. Readings, group discussions, and work with lawyers and third-year law students. (Fall and spring)

191 **Proseminar: International Affairs** (3 or 6) Purcell, Sapin, Reich
(Formerly PSc 197)
Substantive problems of U.S. foreign policy. Readings, term papers, discussion. (Fall and spring)

192 **Proseminar: Political Science** (3) Staff
Examination of selected problems in political science. (Fall and spring)

193 **Proseminar: Urban Affairs** (3 or 6) Burks, Cole
(Formerly PSc 183–84)
Readings, research, and class discussion on selected topics in urban

* Admission requires departmental approval.

politics and policy-making. Primarily for senior urban affairs majors. (Fall and spring)

*196 **Honors Seminar: Political Theory** (3) Staff
Research on selected topics. Prerequisite: PSc 101. (Fall or spring)

*197 **Honors Seminar: American Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101. (Fall or spring)

*198 **Honors Seminar: Comparative Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101. (Fall or spring)

*199 **Honors Seminar: International Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101. (Fall or spring)

Third Group

200 **Scope and Methods of Political Science** (3) Linden, Wayne, Shaffer
Introduction to the discipline and profession, analysis and comparison of some approaches to political inquiry, and empirical research design. (Fall and spring)

201 **Empirical Political Analysis** (3) Darcy, Cole
(Formerly PSc 207)
Techniques of social science data analysis. Emphasis on using computers for statistical analysis in political research. No previous experience with statistics or computers required. (Fall)

202 **Advanced Topics in Empirical Political Analysis** (3) Darcy, Cole, Shaffer
(Formerly PSc 210)
Advanced techniques of data collection and analysis; varying emphasis on such methods as casual modeling, analysis of variance, regression analysis, and simulation. (Spring)

203 **Public Policy Analysis** (3) Declercq, Teich
(Formerly PSc 244)
Reading and research on systematic methods of public policy analysis. (Spring)

205 **Readings in Political Theory** (3) Linden
(Formerly PSc 217)
Selected major works, both ancient and modern, which illuminate basic problems and questions of political theory. (Fall)

206 **Normative Political Theory** (3) Linden, Fischer
(Formerly PSc 318)
Advanced readings and group discussions. Analysis and interpretation of selected concepts and schools of thought. (Spring)

207 **Readings in Socialism and Communism** (3) Elliott, Linden
(Formerly PSc 224)
Readings and discussions of works illuminating the evolution of pre- and post-Marxist socialism. (Fall)

*Admission requires departmental approval.

208 Readings in Marxism-Leninism (3) Elliott, Linden
(Formerly PSc 325 Research Seminar: Topics in Marxism-Leninism)
Readings and discussions in Marxism-Leninism and its controversies from Lenin to the present. (Spring)

209 Democratic Theory (3) Staff
Readings and discussions in democratic theory. Attention to recent work toward formulation of adequate theory in American political science. (Fall or spring)

210 American Political Thought (3) Staff
Readings and discussions. Analysis and evaluation of major intellectual sources of American political thought.

211 State Politics (3) Burks, Cole, Declercq
(Formerly PSc 203)
Comparative analysis of American state politics, including state political institutions and policy-making processes, state policy choices, and the state role in the federal system. (Fall)

212 Urban Politics (3) Burks, Cole
(Formerly PSc 204)
The socioeconomic, demographic, and cultural context of urban politics; informal patterns of power and influence in urban decision-making; formal institutions and policy-making processes; urban policies and their impacts. (Spring)

213 Intergovernmental Relations (3) Burks, Cole
(Formerly PSc 236)
Analysis of the fiscal, structural, social, and political aspects of the evolving federal system; emphasis on metropolitan government. (Fall)

214 Topics in Constitutional Law (3) Morgan
(Formerly PSc 221 The United States Constitution and the Judicial Function)
Lectures and group discussions on constitutional law and politics. (Fall, even years)

215 Judicial Policy-making (3) Morgan
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues. (Fall, odd years)

216 American Presidency (3) Wayne
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making. (Fall)

217 Bureaucratic Politics (3) Declercq, Mackenzie, Teich
Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy. (Spring)

218 Legislative Theory and Behavior (3) Declercq, Mackenzie
Organization, behavior, and policy outputs of the U.S. Congress. (Spring)

219 **American Political Parties and Interest Groups** (3) LeBlanc
(Formerly PSc 245 The American Political Process)
Nature and functions of political parties and interest groups, with special emphasis on the party influences on electoral behavior and congressional decision-making. (Fall)

220 **Public Opinion and Voting Behavior** (3) Darcy
(Formerly PSc 248)
Sources and dynamics of public opinion, political socialization, and voting behavior. (Spring)

222 **Government, Science, and Technology** (3) Logsdon, Teich
(Formerly PSc 205)
National and international policy issues which arise from the interaction between scientific and technological development and governmental activity. (Fall)

223 **Science, Technology, and Public Affairs** (3) Logsdon, Teich
(Formerly PSc 206)
Selected public policy issues with significant scientific or technological aspects. (Spring)

230 **Comparative Government and Politics I** (3) Kim, Starrels, McClintock
(Formerly PSc 211)
Examination of basic approaches to comparative politics. (Fall)

231 **Comparative Government and Politics II** (3) Kim, Starrels, McClintock
(Formerly PSc 212)
Comprehensive examination of specific issue areas in comparative political analysis. (Spring)

*232 **Comparative Communist Systems I** (3) Staff
(Formerly PSc 213)
Ideological foundations of communism; emergence of the Soviet system; development of the international communist movement to World War II; postwar formation of the Soviet bloc. (Fall)

*233 **Comparative Communist Systems II** (3) Hinton
(Formerly PSc 214)
Comparative analysis of recent ideological trends, political institutions, and behavior among ruling and nonruling Communist Parties. (Spring)

240 **Theories of International Politics I** (3) Nimer, Shaffer
(Formerly PSc 275)
Critical examination of contemporary theories, both empirical and normative, with emphasis on actor theory. (Fall)

241 **Theories of International Politics II** (3) Nimer, Shaffer
(Formerly PSc 276)
Critical examination of contemporary theories, both empirical and normative, with emphasis on interaction theory. (Spring)

*An interdepartmental course offered by the History and Political Science Departments.

242 **Problems in International Organizations I** (3) Nau, Stambuk
(Formerly PSc 271)
Political dimensions of international organizations: special reference to the United Nations. (Fall)

243 **Problems in International Organizations II** (3) Nau, Stambuk
(Formerly PSc 272)
Operational and administrative aspects of international organizations: special reference to regional and functional bodies. (Spring)

244 **International Law I** (3) Fischer
(Formerly PSc 281)
Readings in selected areas. (Fall)

245 **International Law II** (3) Fischer
(Formerly PSc 282)
Research in selected areas. (Spring)

246 **U. S. Foreign Policy** (3) Purcell
(Formerly PSc 267)
Research and selected reading as the basis for analysis of U.S. foreign policy. Particular reference to the decision-making process and policy execution. (Fall)

247 **Public Opinion and Foreign Policy** (3) Purcell
(Formerly PSc 273)
Research and readings on U.S. public opinion interest groups that influence foreign policy. (Spring)

248 **U. S. National Security Policy-making** (3) Sapin
(Formerly PSc 283)
Executive organization and processes for national security policy-making. Attention to relevant theoretical approaches. (Fall)

249 **U. S. National Security Policy** (3) Sapin
(Formerly PSc 284)
Fundamental considerations: selected issues, e.g., arms control and disarmament, regional security problems, military assistance. (Spring)

251 **Principles and Problems of International Political Communication** (3) Staff
(Formerly PSc 274)
Reading and discussion of public opinion/foreign policy relationships and operation of international political communication programs by major world powers as a tool of foreign policy. (Spring)

252 **Science, Technology, and World Order** (3) Nau
(Formerly PSc 208)
Intensive reading, discussion, and research on the impact of science and technology on world order, in particular on the claim that a new global politics is replacing traditional or nation-state politics. (Spring)

260 **Western European Politics** (3) Starrels
(Formerly PSc 219)
Comparative examination of major characteristics of the political

systems in France, England, and the two Germanies. Special attention to political culture, socialization, recruitment, and communication. (Fall and spring)

261 **Problems in Transnational and Comparative Politics of Western Europe** (3) Stambuk
(Formerly PSc 256)

National and supranational political processes in Western Europe: emphasis on comparative analysis of interest aggregation and articulation, interbureaucratic relations, and selected policy outcomes.

264 **Political and Social Institutions of Eastern Europe** (3) Gyorgy
(Formerly PSc 270)

Major political and social factors which have shaped the inter-war, World War II, and post-war evolution of Eastern Europe: emphasis on selected countries. (Fall)

265 **Governments and Politics of Eastern Europe** (3) Gyorgy
(Formerly PSc 227)

Comparative study of Eastern European states: political, social, economic institutions; problems of regional integration and relations with outside powers. (Spring)

266 **Readings in Soviet Government and Politics** (3) Elliott, Linden
(Formerly PSc 229)

Readings in contemporary Soviet domestic government and politics. (Fall)

267 **Soviet Government and Politics** (3) Elliott, Linden
(Formerly PSc 233)

Research seminar in selected problems of Soviet domestic government and politics. Emphasis: since Stalin. Prerequisite: PSc 266 or permission of instructor. (Spring)

268 **Soviet Foreign Policy** (3) Elliott
(Formerly PSc 269)

External problems and policies of the USSR. Relations with other communist states, Western powers, other countries, and non-ruling communist parties. (Spring)

269 **Soviet Military Policy and Strategy** (3) Wolfe
(Formerly PSc 288)

Soviet developments in military policy and strategy with attention to intra-bloc military cooperation, political context of Soviet military policy, significant changes in recent Soviet military thought. (Fall or spring)

270 **Politics of Mainland China I** (3) Hinton
(Formerly PSc 265 Chinese Communist Policy Processes)

Introduction to the literature and to graduate research in contemporary Chinese politics. Readings and group discussion. (Fall)

271 **Politics of Mainland China II** (3) Hinton
(Formerly PSc 266 Chinese Communist Policy Processes)

Introduction to the literature and to graduate research in contemporary Chinese politics. Research seminar. (Spring)

272 **Foreign Policy of Mainland China** (3) Hinton
(Formerly PSc 295 Chinese Communist Foreign Policy)
Objectives: formulation and implementation: Communist China as Asian state, revolutionary influence, would-be great power. (Spring)

273 **Governments and Politics of South and Southeast Asia** (3) Purcell
(Formerly PSc 293)
Research and selected readings as basis for analysis of structure problems, and policies of the governments of selected countries particular reference to India. (Spring)

274 **Southeast Asia in World Politics** (3) Staff
(Formerly PSc 298)
Southeast Asia in great-power perspective. Balance-of-power concept and development of Asian subsystem. (Spring)

275 **International Politics of the Far East** (3) Hinton
(Formerly PSc 296)
Foreign policies and international behavior of regional states and extraregional powers, principally the U.S. and the Soviet Union (Fall)

276 **Governments and Politics of Japan and Korea** (3) Staff
(Formerly PSc 294)
Readings and research on the domestic and foreign policies of Japan, North and South Korea. (Fall or spring)

277 **Governments and Politics of the Middle East** (3) Reich
(Formerly PSc 291)
Readings and research on selected problems of the governments and politics of the Middle East. (Spring, even years)

278 **International Relations of the Middle East** (3) Reich
(Formerly PSc 279)
Readings and research on the regional and international relations of the Middle East. (Fall)

280 **Governments and Politics of North Africa** (3) Reich
(Formerly PSc 292)
Readings and research on selected problems in the governments, politics, and international relations of North Africa. (Spring, odd years)

281 **Topics in African Politics** (3) Nimer
(Formerly PSc 290)
Readings, research, and discussion of selected aspects of African domestic and international politics. (Spring)

283 **Latin American Politics I** (3) McClintock
(Formerly PSc 277)
Readings and discussions on Latin American political processes and institutions. (Fall)

284 **Latin American Politics II** (3) McClintock
(Formerly PSc 278)
Individual research and class discussion on selected topics. (Spring)

285 **Problems in Latin American Civilization** (3) Staff
(Formerly PSc 287)
Interdisciplinary seminar partially guided by a specialist in the methodology of his her chosen discipline: each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

286 **Selected Topics in American Politics** (3) Staff
Readings and discussion. (Fall or spring)

287 **Selected Topics in Political Theory** (3) Staff
Readings and discussion. (Fall or spring)

288 **Selected Topics in Comparative Politics** (3) Staff
Readings and discussion. (Fall or spring)

289 **Selected Topics in International Politics** (3) Staff
Readings and discussion. (Fall or spring)

291 **Colloquium: East Asia** (3) Staff
(Formerly PSc 254)
Interuniversity research colloquium of faculty members concerned with the study of China, Japan, and Korea. Admission with permission of faculty group. (Fall or spring)

292 **Colloquium: Russia and Eastern Europe** (3) Gyorgy
(Formerly PSc 255)
Interuniversity research colloquium of faculty members concerned with the study of Russia and Eastern Europe. Admission with permission of faculty group. (Fall and spring)

297 **Reading** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

298 **Research** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

Fourth Group

301 **Advanced Reading and Research in Political Theory** (3) Staff
(Fall or spring)

310 **Advanced Reading and Research in American Politics** (3) Staff
(Fall or spring)

340 **Advanced Reading and Research in Comparative Politics** (3) Staff
(Fall or spring)

350 **Advanced Reading and Research in International Politics** (3) Staff
(Fall or spring)

397 **Advanced Reading** (3) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

398 **Advanced Research** (3) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (3) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PORTUGUESE

See **Romance Languages and Literatures.**

PSYCHOLOGY

Professors E.L. Phillips, J.N. Mosél *(Chairman)*, B.I. Levy, W.E. Caldwell, R.D. Walk, R.K. White *(Emeritus)*, M.L. Meltzer, A.D. Kirsch, C.E. Rice, E. Abravanel, D.E. Silber, J. Miller
Adjunct Professors R.F. Caron, J.B. Margolin
Professorial Lecturers R.K. Kahn, W.A. McClelland, M. Shore
Associate Professors C.E. Tuthill, R.H. Tanck *(Research)*, S.A. Karp, R.W. Holmstrom, C.J. Lange, L.A. Rothblat
Adjunct Associate Professor D.G. Kleiman
Associate Professorial Lecturer S.L. Cohen
Assistant Professors P.J. Poppen, L. Brandt, S.K. Green, A.R. Bruhn, S. Hashtroudi
Assistant Professorial Lecturer S.A. Sibley

Clinical Training Staff

Associate Professor J.J. McMillan
Associate Clinical Professors I.M. Zimmerman, J. Borriello, J.W. Cummings, M.E. Zedek, E. Blum, P.D. Daen

Bachelor of Arts with a major in psychology (departmental) –The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses--seven or eight semester hours selected from Psyc 1, 5 and 6.
3. Required courses in related areas:

(a) three semester hours selected from Stat 51, 53, or any first-group course in mathematics except Math 6. (Students expecting to do graduate study in psychology should elect Stat 53.)

(b) 12 semester hours selected from American civilization, anthropology, economics, geography and regional science, history, philosophy (Phil 71, 113, 151 recommended), political science or sociology, of which six hours must be from one of the following: anthropology, economics, history, political science or sociology. If a student takes more than six hours in any one department the excess will be credited to electives.

4. Required courses in the major—24 semester hours in second-group psychology courses, including Psyc 196 and one course from each of the following groups—*Group A*: Psyc 118, 121, 161; *Group B*: Psyc 115, 144, 151, 156; *Group C*: Psyc 101, 112, 129, 131.

It is recommended that students contact their academic advisers as soon as possible for assistance in planning their programs of study.

Although there is no foreign language requirement, students contemplating graduate study are reminded that most graduate schools require knowledge of one and sometimes two foreign languages.

Master of Arts in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology at this University, or an equivalent degree. Admission to the program is limited; preference will be given those who plan to continue toward a Doctor of Philosophy degree.

Required: the general requirements, pages 89–97. Of the 24 required semester hours (exclusive of the thesis), a minimum of 18 must be in third-group psychology courses including Psyc 202 and either 203 or 204; six may be in related fields approved by the department. For detailed requirements consult the chairman of the department.

Doctor of Philosophy in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology. Students admitted from other disciplines will be expected to complete prerequisite undergraduate courses to prepare for graduate study in psychology. Qualifying scores on the Miller Analogies Test and the Aptitude Test of the Graduate Record Examination are required for admission.

Required: the general requirements, pages 89–91, 97–99, including (1) the satisfactory completion of the tool requirement (see page 97); (2) Psyc 202, 203–4, Stat 105; and (3) the satisfactory completion of a Preliminary Examination and later, a major Field Examination.

Areas of study: clinical, developmental, experimental, industrial and organizational, and social psychology.

Students electing psychology courses in the freshman year should begin with Psyc 1; with permission of instructor students may elect Psyc 5–6 in the freshman year.

Departmental prerequisite: Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. Six semester hours in psychology courses are prerequisite to all second-group courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

First Group

1 General Psychology (3) — **Staff**

Fundamental principles underlying human behavior. (Fall and spring)

5–6 Principles and Methods of Psychology (4–4) — Walk, Hashtroudi

Lecture (3 hours), laboratory (3 hours). An experimental approach to understanding behavior; individual and class experiments performed. Psyc 5: sensation, perception, and emotions and their relation to adaptive behavior. Psyc 6: topics of motivation, learning, memory, and problem-solving. Laboratory fee, $6 a semester. (Academic year)

8 Psychology of Motivation and Personality (3) — Tuthill, Rice, Holmstrom, Brandt

Introduction to the psychology of personality. Principles of motiva-

tion, personality development, social and cultural factors, and assessment and description of personality emphasized. (Fall and spring)

22 **Introduction to Educational Psychology** (3) Kirkbride, Tanck, McClelland

The contributions of psychology to education; emphasis on learning. (Fall and spring)

29 **Psychology of Childhood** (3) Brandt, Bruhn

Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world. (Fall and spring)

Second Group

101 **Abnormal Psychology** (3) Silber, Holmstrom

Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. Prerequisite: six semester hours in psychology or three in psychology and six in a biological science. (Fall and spring)

104 **Ecology and Mental Health** (3) Karp

Examination by field research of the linkages between aspects of the physical environment and mental health. Lectures and student field research projects. (Fall)

105 **The Psychology of Consumer Behavior and Attitudes** (3) Phillips

Consumer behavior and attitudes in regard to advertising, buying habits, consumer action groups and social pressures, and mass persuasion. Lectures and field work. (Spring)

108 **Humanistic Psychology** (3) Mosél

Critical examination of humanistic psychology. Emphasis on role of consciousness in human behavior. Philosophic foundations, existential and phenomenological psychology, the new mentalism. (Spring)

110 **Perception and Understanding in Children** (3) Abravanel

Concepts and research in the area of developmental psychology, emphasis on the growth and development of perception, cognition, and language. (Spring)

112 **Psychology of Adolescence** (3) Bruhn, Johnson

Psychological characteristics and problems peculiar to adolescence with emphasis on application of psychology to solution of such problems. (Fall and spring)

115 **Psychology of Language and Communication** (3) Mosél

Introduction to psycholinguistics and verbal behavior. Information theory, generative grammar theory, cultural and linguistic structures in the perception and learning of language. (Fall and spring)

117 **Psychology of Art and Picture Perception** (3) Walk

Theories of Arnheim, Gibson, Gombrich, and Goodman as related to art and picture perception; study of cross-cultural research and research with children.

118 Neuropsychology (3) — **Rothblat**

Analysis of neural processes underlying behavior. Basic structure and functions of the nervous system, with emphasis on sensory processes, learning and memory, motivation, and emotion. (Fall and spring)

119 Group Dynamics (3) — **Miller**

Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Lewin, Bion, Mills, Slater, Mann, Miller, and Rice. Attendance at a weekend group relations conference, using techniques developed at the Tavistock Institute, London, required. Enrollment limited. (Spring and summer)

121 Psychology of Learning (3) — **Hashtroudi**

Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects. (Fall)

122 Psychology and Human Relations (3) — **Silber**

Understanding human relations and T-group techniques by evolving an on-going T-group within the course itself. For junior and senior undergraduate social science majors; open to others with permission of instructor. (Summer)

124 Aggression: Its Nature and Determinants (3) — **Abravanel**

Study of research with adults, children and animals; influence of mass media and cultural comparisons in handling and channeling aggression. Examination of contemporary theories of aggression.

129 Theories of Personality (3) — **Karp, Poppen**

Survey of personality theories; emphasis on their application to problems of individuals. (Fall and spring)

130 Seminar: Political and Social Implications of Current Approaches to Psychological Treatment (3) — **Karp**

Discussion and presentation of recent works, such as those of Szasz, Goffman and various writers on minority liberation, bearing upon the implications for individuals and society of various approaches to psychological treatment, including psychotherapy and behavior modification.

131 Psychological Tests (3) — **Hunt, Karp, Holmstrom**

Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, $7. (Fall and spring)

132 Socialization in Childhood (3) — **Brandt**

Examination of primary methods by which the child is shaped in terms of social judgment and self control: internalization of controls, assimilation of societal values and parenting procedures. Organized by focus on issues according to developmental level.

135–36 Seminar: Community Mental Health (3–3) — **Miller**

Survey of issues and techniques in community mental health; emphasis on educational systems and community mental health in the

schools. Involves practicum work in school setting. Open to juniors and seniors with permission of instructor. Prerequisite to Psyc 136: Psyc 135. (Academic year)

144 **Personnel and Industrial Psychology** (3) Cohen, Mosél

Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity. (Fall and spring)

150 **Psychology of Sex Differences** (3) Poppen

Relevant biological, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 **Social Psychology** (3) Tuthill, Poppen, Green

Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism and war. (Fall and spring)

154 **Psychology of Criminology** (3) Silber

Examination of many psychological aspects of criminal behavior; personality of criminals and of psychological processes affecting behavior.

156 **Psychology of Attitudes and Public Opinion** (3) Tuthill

Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare. (Spring)

158 **Psychology of Interpersonal Attraction** (3) Green

Psychological bases for interpersonal attraction; emphasis on personal variables, relevant theoretical approaches and effects of attraction on other behavior.

161 **Comparative Psychology** (3) Caldwell

Lectures and demonstration on animal psychology. Psychological processes in infrahuman organisms, evolution of behavior, the place of animal experimentation and research in psychology. (Spring)

170 **Clinical Psychology** (3) Levy

An exploration of the history, functions, and problems of the clinical psychologist. Assessment, treatment, community approaches, ethics. Prerequisite: Psyc 101, 131. (Spring)

188 **Attitudes toward Death and Dying** (3) Staff

Exploration of the many different aspects, attitudes, and experiences associated with the process of death and dying. Limited to juniors and seniors.

191 **Independent Research in Psychology** (3) Staff

Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit. (Fall and spring)

192 **Field Experience in Psychology** (3) Abravanel

Selected senior psychology majors will spend a minimum of six hours a week in a local hospital, school, or community setting. Students registering for this course must have the approval of the instructor by May 15 for the fall semester and by December 15 for the spring semester. (Fall and spring)

196 **History and Systems of Psychology** (3) Caldwell, Rice

Senior capstone course which includes a survey and integration of the major viewpoints and concepts of psychology. Required of psychology majors. (Fall and spring)

197 **Honors Seminar in Psychology** (3) Staff

Selected topics in psychology which change from semester to semester. Intended primarily for juniors who plan to enroll in Psyc 191 (independent research) in the senior year. May be repeated for credit.

198 **Current Research Issues in Psychology** (3) Staff

Conducted as a seminar. Recent experiments in psychology, including those performed by members of the class; emphasis on student participation. May be repeated for credit.

Third Group

Third-group courses are limited to graduate students in psychology, except by special permission of instructor.

202 **Psychological Research Methods and Procedures** (3) Abravanel, Holmstrom, Silber

Required in all graduate psychology programs. Prerequisite: graduate standing, a laboratory course in psychology, and an elementary course in statistics. (Spring)

203–4 **Experimental Foundations of Psychology** (3–3) Hashtroudi, Rothblat and Staff

Required of doctoral students in psychology during first year of study. Psyc 203: basic issues in learning and motivation. Psyc 204: physiological processes; sensation and perception. (Academic year)

205 **Research Methods in Intervention Programs** (3) Karp

Special problems of conducting research in a clinical setting; emphasis on content and method of studies designed to assess effects of therapeutic intervention. Prerequisite: Psyc 202. (Fall)

206 **Methods of Clinical and Personality Research** (3) Rice

Review of techniques especially relevant to research in clinical, personality, and social psychology. Scaling methods, multivariate techniques, introduction to the use of computers in data analysis. Prerequisite: Psyc 202; Stat 105 or equivalent. (Spring)

207–8 **Psychological Assessment** (3–3) Holmstrom, Levy, Silber

Open only to clinical graduate students in the Department of Psychology. Theoretical and clinical aspects of assessment; includes interviewing, psychometric tests, and projective techniques. Two-hour laboratory—diagnostic work at clinical facilities. Material fee, $7 a semester. (Academic year)

209 **Seminar: Psychology of Motivation** (3) Caldwell

Various theoretical approaches to the psychology of motivation; systematic concepts and experimental findings deriving from each approach. (Spring)

211 **Assessment of Cognitive Functioning** (3) Levy

Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $7. Admission by permission of instructor. (Summer)

212 **Personality Assessment by Projective Techniques** (3) Levy

Methods of personality assessment, primarily the Rorschach. Material fee, $7. Admission by permission of instructor. (Summer)

213–14 **Seminar: Developmental Psychology** (3–3) Abravanel, Walk, Brandt

Psyc 213: research and theory in developmental psychology, emphasis on perceptual and cognitive development; consideration of the development of social awareness and of genetic-biological growth processes. Psyc 214: current research and theory in perceptual and cognitive development, intensive study of selected research problems. (Academic year)

215 **Personality Assessment by Multiple Procedures** (3) Brandt, Bruhn

Consideration and use of a wide range of procedures in assessment of personality and psychopathology of children. Prerequisite: Psyc 207–8 or 211 and 212. Graduate students in fields other than psychology admitted by permission of instructor. Material fee, $7. (Summer)

216 **Psychological Assessment by Graphic Means** (3) Levy

Examination of graphic procedures for assessment of intelligence and personality; clinical use and evidence of validity. Common interpretive principles sought. Human figure drawings and free paintings as examples. Admission by permission of instructor. (Fall)

218 **Seminar: Systems of Psychotherapy** (3) Holmstrom, Silber

Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. Limited to graduate students in clinical psychology except when offered in Summer Sessions. (Spring)

219 **Group Dynamics** (3) Miller

Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Lewin, Bion, Mills, Slater, Mann, Miller, and Rice. Attendance at a weekend group relations conference, using techniques developed at the Tavistock Institute, London, required. Enrollment limited. (Spring and summer)

220 **Seminar: Abnormal Psychology** (3) Silber

Study of selected problems of psychopathology. (Fall)

221–22 **Seminar: Group Psychotherapy** (3–3) Borriello

For graduate students in the clinical psychology program. Open to

others if space permits and with permission of instructor. Psyc 221: didactic material and laboratory experience with emphasis on group dynamics and processes, survey of group therapy approaches. Psyc 222: supervised experience with therapeutic groups. Prerequisite to Psyc 222: Psyc 221. (Academic year)

223 **Seminar: Learning** (3) Hashtroudi
Selected topics of current research interest in the psychology of learning. (Spring)

226 **Seminar: Clinical Psychology of Childhood and Adolescence** (3) Brandt
Survey of behavior and personality disorders.

227–28 **Seminar: Principles of Psychotherapy** (3–3) Kahn
For graduate students in clinical psychology; open to others, with permission of instructor, only if space permits. Patient's needs and demands on the therapist. Case participation heavily relied upon. Prerequisite: Psyc 218. (Academic year)

229 **Seminar: Principles of Behavior Change** (3) Phillips
Stimulus-organism-response variables and their interactions, with emphasis on learning theory as applied to clinical problems. (Fall)

230 **Seminar: Operant Applications to Clinical Problems** (3) Sibley
Examination of the broad role of reinforcement contingencies, behavior shaping, and other experimentally derived concepts as they apply to the management and control of a wide variety of human clinical problems. Prerequisite: Psyc 229. (Spring)

231 **Development of Psychometric Instruments** (3) Mosél
Quantitative techniques and principles used in construction, standardization, and evaluation of personality and ability measures for research and practice; quantification of human judgment for measurement purposes. Prerequisite: course in tests and measurements and an elementary course in statistics. (Fall)

234 **Seminar: Theory of Psychological Measurement** (3) Mosél
Development of classical axiomatic-deductive theory underlying major notions in the construction and evaluation of psychological tests. (Spring)

235–36 **Seminar: Community Mental Health** (3–3) Miller and Staff
For graduate students in the department of psychology; open to others, with permission of instructor, only if space permits. Survey of issues and techniques in community mental health; emphasis on educational systems and community mental health issues in the schools. Involves project in school setting. Prerequisite to Psyc 236: Psyc 235. (Academic year)

245 **Seminar: Organizational Behavior** (3) Mosél
Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design. (Fall)

246 **Seminar: Personnel Measurement Techniques** (3) Mosél

Detailed consideration of techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, and performance ratings.

247 **Seminar: Psychological Tests and Equal Opportunity** (3) Hunt

Technical, professional, practical, and legal demands of psychological test use. Current problems of fairness, discrimination against minorities, and test validation. (Summer)

248 **Organizational Behavior Research Applied to Organizational Intervention and Change** (3) Cohen

Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program-evaluation criteria. (Spring, even years)

251 **Seminar: Advanced Social Psychology** (3) Tuthill, Poppen, Green

Current research and theory: motivation and cognition, dissonance, social interaction theory, authoritarianism, class differences, group dynamics, group conflict. (Fall)

252 **Research Methods in Social Psychology** (3) Tuthill, Poppen, Green

Selected methods such as public opinion polling, attitude scaling, interviewing, content analysis, naturalistic observation, field research or laboratory experimentation. (Fall and spring)

254 **Seminar: Experimental Social Psychology** (3) Tuthill

Experimental study of small groups, group climates, interaction process analysis. Lewin's field-theoretical approach to individual and group processes. (Spring, odd years)

256 **Seminar: Psychological Causes of War** (3) White

An attempt to integrate evidence from animal behavior, child behavior, anthropology, psychiatry, and recent history, including World Wars I and II and the present East-West conflict. (Spring)

257 **Current Topics in Social Psychology** (3)

Advanced seminar. (Fall and spring)

258 **Seminar: Attitude Change** (3) Tuthill

Review of recent research literature on attitude formation and change. Examination of theories of attitude change and experimental findings. (Spring, even years)

261 **Seminar: International Communication** (3) Mosél

Primarily for students in the School of Government and Business Administration and School of Public and International Affairs. Communicating information and effecting attitude change across cultures by mass media. Psychocultural factors and the functions of mass communication in the development of transitional societies. (Spring)

*267 **Interdisciplinary Study of Language Disorders** (3)

For graduate students in education, speech and hearing, and psychology. Psycho-educational team participation, team diagnosis, and analysis of case studies. Multidisciplinary understanding of philosophies of learning and treatment of symbolic malfunctioning. (Fall)

268 **Seminar: Neuropsychology** (3) Rothblat

Selected problems in research relating the brain and behavior. Independent topics each semester such as sensory processing, brain development and behavior, clinical aspects of nervous system function.

†269 **Practicum: Interdisciplinary Study of Language Disorders** (3)

For graduate students by arrangement with the Reading Center, the Speech and Hearing Clinic or the Clinical Psychology Program. Psycho-educational teams working in clinical setting providing assessment and remediation of symbolic malfunctions.

272 **Seminar: Theories of Personality** (3) Caldwell

Emphasis on theoretical problems and methodology in the field of personality study. (Fall, odd years)

274 **Comparative Psychology and Ethology** (3) Caldwell

Synthesis of the principles and findings of ethology and comparative psychology. Examination of the theories and findings of Lorenz, Tinbergen, and Jakob von Uexküll in the light of recent experimental investigations. (Fall, even years)

289 **Seminar: Current Topics in Experimental Psychology** (3) Staff

Review and discussion of contemporary research and theory in a specialized field of psychological study, by leaders in the field. Independent topics each semester; may be repeated for credit. (Fall and spring)

291 **Theories of Organizational Behavior** (3) Cohen

Examination of current theoretical models and research. (Spring)

292 **Seminar: Perception** (3) Walk

Study of current research and theory in the experimental psychology of perception. (Spring)

293 **Seminar: Psychology of Thinking** (3) Rice

Review of basic theoretical positions and research concerning the processes of cognition: memory, concept formation, and reasoning.

295 **Independent Research in Psychology** (3) Staff

Individual library or experimental research under supervision of staff member. Arrangements must be made with sponsoring faculty member prior to registration. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

* An interdisciplinary course offered by the Departments of Education, Psychology, and Speech and Drama.

† An interdisciplinary course offered by the Departments of Education and Psychology.

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy major field examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PSYCHIATRY AND BEHAVIORAL SCIENCES

The following course, offered by the Department of Psychiatry and Behavioral Sciences in the University's School of Medicine and Health Sciences, is opened to advanced graduate students in clinical psychology. For detailed description, consult the *School of Medicine and Health Sciences Bulletin*.

365–66 **Seminar: Clinical Introduction to Family Diagnosis and Therapy** (3–3)

PUBLIC ADMINISTRATION

Professors D.S. Brown, H. Malmgren
Professorial Lecturers C.L. Berg, T.W. Taylor, J.L. Westrate
Associate Professors S.R. Chitwood, M.M. Harmon *(Chairman)*
Associate Professorial Lecturers J.F. Magnotti, Jr., T. Maher
Assistant Professors B.L. Catron, C.W. Washington
Assistant Professorial Lecturer M.B. Young

Programs of study in Public Administration leading to the degrees of Master of Public Administration, Master of Arts in Government, and Doctor of Public Administration are offered by the School of Government and Business Administration (see pages 127–59).

Third Group

205 **Introduction to Public Administration and Management** (3) Staff
Historical development, contemporary approaches, roles of the public manager. Ethics and norms, administrative responsibility and public interest.

210 **Concepts and Issues in Public Administration** (3) Brown, Harmon
Introduction to graduate study in public administration. Professionalism and the public service. Nature of public interest: multiplicity of organizational objectives. Administrative responsibility and individual and organizational ethics. Individual goals and career planning. (Fall and spring)

213 **Administration in the Federal Government** (3) Brown, Taylor, Westrate
Critical analysis of federal administrative organizations as an integral part of the political system. Roles of Congress, the President,

the courts, interest groups, political parties and the public in the public decisional process. Special attention to centripetal and centrifugal forces. (Fall and spring)

214 **Policy Analysis in Public Administration** (3) Catron

Introduction to systematic analysis of public policy alternatives. Development of conceptual frameworks for differentiating types of public policies, e.g., distributive, regulatory, redistributive; examination of the contribution of economic, quantitative and research techniques to the development, administration and evaluation of these policies. (Fall and spring)

217 **Seminar: Development Administration I** (3) Belaunde-Terry

The nature of underdevelopment. Specific problems of less developed countries. National cultures and political and administrative systems. The giving of assistance: types of foreign aid: problems of working with aid givers. (Fall)

218 **Seminar: Development Administration II** (3) Brown

Problem of the transfer of administrative capability from one country to another. Political and administrative development. Unilateral and multilateral approaches. The role of the innovator. Strategies of administrative development. (Spring)

220 **Law and the Public Administrator** (3) Chitwood

Exploration and analysis of the functions of law in a democratic society. Emphasis is placed upon the procedural, historical and jurisprudential dimensions of American law. This broad perspective seeks to convey a more perceptive understanding of the law as a legal and moral force guiding and constraining public decision making. (Spring)

221 **Organization Theory and the Public Sector** (3) Catron

Analysis of organization theory with special focus on public organizations; current issues in organization theory: decision-making, the organizational environment and the changing nature of organizations in a post-industrial society. (Fall and spring)

223 **Behavioral Factors in Large and Complex Organizations** (3) Brown

(Formerly Behavioral Factors in Large Organizations)

Analysis of the nature and characteristics of large organizations. Bureaucracies and their behavioral patterns; dysfunctionalism. Approaches to policy guidance and leadership, particularly in large public organizations; influence and control systems. Future trends. (Fall and spring)

231 **Public Personnel Administration** (3) Sommers

Survey of basic principles and functions of personnel administration in the public service. Roles of personnel management, recruitment, placement, wage and salary administration, training, retirement and other personnel functions. (Fall)

232 **Problems in Public Personnel Management** (3) Sommers

Analysis and evaluation of major personnel management problems in government; employee-management relations; interagency and intergovernmental relationships. Impact of automation. Evaluation of personnel systems. (Spring)

233 **Seminar: Manpower Development and Utilization** (3) Staff

Examination of public and private manpower trends, problems, policies, and programs. Exploration of approaches, old and new, to manpower development and utilization. Analysis of impact of economic, political, and social factors on manpower. Students will select a specific area for individual investigation. (Fall)

235 **Technology Change and Professional Human Resource Planning** (3) Roman

Research, discussion and readings dealing with manpower problems arising from automation and other technological changes. Evaluation of these developments in government and business; their implications for productivity, employment, training and education, and personnel and industrial relations. Analysis of economic, political, and social factors influencing public and private manpower policies. (Spring)

236 **Labor-Management Relations in the Public Sector** (3) Staff

Principles and current issues in public sector labor relations; collective bargaining and the merit concept, scope of bargaining, representation elections, unfair practices, grievance procedures, bilateralism and the management process.

245 **Intergovernmental Relations** (3) Magnotti

Assessment of the impacts and consequences of changes in the administration of intergovernmental policies and programs in the federal system. Legislation, roles and responsibilities of federal, state, regional and local systems will be examined from both theoretical and practical vantage points to understand their effects. (Fall and spring)

246 **Dynamics of Citizen Participation in Administration** (3) Staff

Examination of the nature of participation in a democratic society. An analysis of the characteristics and dynamics of citizen-based organizations. Exploration of effective methods or models by which administrators may utilize citizen participation. (Fall)

248 **Financing Local Government** (3) Staff

Analysis of the structure and administration of public finance in local governments. Includes the financing of services through municipal taxation and other revenue sources, debt administration and implications of the budgetary process. (Fall and spring)

249 **Urban Public Policy** (3) Staff

Examination of views of the city. Emphasis on urban systems in their social, political, economic and physical aspects. Against the background of urban politics and administration, will address such central functional areas as health, education, welfare, crime, poverty, transportation and housing. (Fall and spring)

250 **Administration of State and Local Governments** (3) Staff

Examination of state and local governmental structures and functions, public and private demands, their place within the federal system, their limitations and alternatives available to encourage more effective administration. (Fall and spring)

251 Governmental Budgeting (3) Page

Survey of the basic concepts, principles and practices in governmental budgeting, interrelationship of planning, programming, and budgeting; their role in the management process. (Fall and spring)

252 Public Expenditure Analysis and Planning (3) Chitwood

Intensive analysis of managerial and economic procedures and techniques used by government agencies for planning, allocating and managing scarce resources in the achievement of public programs. Topics discussed include benefit-cost analysis, program budgeting, systems analysis, present value analysis, and government contracting. (Fall and spring)

260 Policy Formulation and Administration (3) Harmon

Normative and analytical models of the policy process; effects of decision-making and institutional arrangements on public policy formulation and implementation. (Fall and spring)

262 Seminar: Science, Technology and Public Policy (3) Black

The impact of science and technology upon public administration in terms of both administrative practice and national policies. (Spring)

290 Special Topics in Public Administration (3) Staff

Experimental course offering; new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

292 Public Program Evaluation (3) Staff

Theory and practice of program evaluation and evaluative research. Exploration of scope and limitations of current practice in evaluation due to economic, political, social and administrative factors. Examination of methodological considerations for data collection, analysis and dissemination. Students will conduct individual evaluative projects. (Spring)

294 Statistical Applications in Public Administration (3) Staff

Use of statistics and computers in research and program evaluations. Development of basic statistical competency; frequency distribution, graphic presentation, sampling, central tendency, variability, correlation, probability, regression, nonparametric tests; computer assistance.

295 Research Methods (3) Staff

Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. (Fall and spring)

298 Directed Readings and Research in Public Administration (3) Staff

Supervised reading in selected fields within public administration. Admission by permission of instructor. May be repeated once for credit. (Fall and spring)

299 Thesis Seminar (3) Staff

Examination of thesis standards, research philosophy and methodology in public administration. (Fall and spring)

300 Thesis Research (3) Staff

(Fall and spring)

Fourth Group

Fourth group public administration courses are limited to graduate students and are primarily for doctoral students. They are offered as the demand requires.

323 **Seminar: The Large and Complex Organization** (3) Brown
Unique problems of large, complex organizations: public, private, and mixed. Emerging concepts and theories. Selected issues.

373 **Seminar: Public Administration and American Political and Social Institutions** (3) Chitwood
Supervised in depth study of contemporary literature in selected fields and of research methodology in public administration.

374 **Seminar: Trends in Public Administration Theory** (3) Harmon
Survey of contemporary normative and epistemological issues in public administration theory and practice. Analysis of the past and present influence of logical positivism, behavioralism, humanism, existentialism and phenomenology. Required for doctoral students.

377 **Seminar: Social Action and Public Policy** (3) Catron
Interdisciplinary approach to foundations of public policy with focus on theoretical problems of social action. Interrelation of theory and practice. Decision and management as human actions.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Public Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Public Administration candidates. May be repeated for credit.

PUBLIC AND INTERNATIONAL AFFAIRS

Professors R.H. Davison, J.W. Kendrick, R.B. Thompson, J.N. Mosel, F.H. Michael, J. Aschheim, H.L. LeBlanc, R.K. White *(Emeritus)*, A. Gyorgy, B. Nimer, R.P. Sharkey, C.T. Stewart, Jr., J.W. Robb, H.B. Yakobson, H.C. Hinton, H.M. Sachar, G. Stambuk, H. Solomon, V. Petrov, B.M. Sapin, C. Shih, R.K. Lewis, C. Hsieh, G. Sigur, M. Gordon, P.P. Hill, J.A. Morgan, Jr., R. Thornton, H. Pollack *(Research)*, B. Reich, Y. Kim, D. Kay *(Visiting)*, **R.M. Dunn, Jr., C.A. Moser**

Adjunct Professors T.F. Carroll, A. Halpern

Professorial Lecturers J. Hardt, T. Hsia, B. Ramundo, T.W. Wolfe, E.M. **Hadley, J.F. Coates**

Associate Professors W.R. Johnson, R.Y. Yin, J.K. McDonald, C.F. **Elliott**, C.A. Linden, S.J. Wayne, J.M. Logsdon, P.F. Klarén, H.R. Nau, J.C. Lowe, **A.H. Teich, E.O. Pederson, A.M. Yezer**

Adjunct Associate Professors **D. Robinson, V.T. Coates**

Associate Professorial Lecturer **P. True**

Assistant Professors G.C.Y. Wang, D.L. Lee, R.E. Darcy, J.M. Starrels, S.W. Burks, R.L. Cole, D. Fischer, L.P. Ribuffo, C.M. Aho, J.J. Cordes, G.C. **Mackenzie, S. Shaffer, F. Thoumi, C. McClintock**

Programs of study in Chinese language and literature, East Asian Studies (China and Japan), international affairs, public affairs, and urban affairs leading to the degree of Bachelor of Arts and programs of study in East Asian Studies, international affairs, Latin American Studies, public affairs, Russian Studies, and science, technology, and public policy leading to the degree of Masters of Arts are offered by the School of Public and International Affairs (see pages 160–77).

INTERNATIONAL AFFAIRS

The following courses are offered only in the War College curriculum:

260 **Fundamentals of National Power** (3)

261 **International and U.S. Foreign Policy** (3)

262 **National Security Policy of the United States** (3)

297 **Readings in International Affairs** (1, 2, or 3)

299–300 **Thesis Research** (3–3)

RELIGION

Professors R.C. Jones *(Chairman)*, H.E. Yeide, Jr., D. Wallace, Jr.
Associate Professor A.J. Hiltebeitel
Associate Professorial Lecturer E.S. Jospe
Assistant Professors S.A. Quitslund, D.A. Altshuler

Bachelor of Arts with a major in Religion (Field-of-Study)— The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86.
2. Prerequisite courses—Rel 9, 10, and 59–60.

The coordinated field of knowledge upon which the student will be examined for a major examination at the end of the senior year includes the history and literature of the world's religions and the philosophical and ethical problems of religious thought. A student may elect to give special emphasis to Christianity, Judaism, or the religions of India. A proseminar (Rel 199–200) assists the student in preparing for the major examination. A pamphlet containing a detailed description of the major is available in the offices of the dean of Columbian College of Arts and Sciences and the chairman of the Department of Religion.

Master of Arts in the field of religion— Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree.

Required: the general requirements, pages 89-97. Of the 24 semester hours of required courses (exclusive of the thesis), at least 12 must be in third-group religion courses; a maximum of nine may be in a closely related field outside the Department of Religion as approved by the department. The Master's Comprehensive Examination must cover three fields (the thesis research must be on one of these three fields) selected from the following: the Old Testament, the New Testament, history of Christianity, Judaism, history of religion in America, modern religious thought, ethics, sociology of religion, and history of religions. A reading knowledge examination, usually in French or German, is required; however, Hebrew or Greek is acceptable for those students whose thesis area is in the Biblical field and Sanskrit or an Eastern language for those whose thesis area is in the history of religions.

Master of Arts in the field of Religious Education Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree. The undergraduate program should have included the following courses or equivalent: Anth 1; Educ 108; Psyc 1, 22, and 29; SpDr 1 or 11.

Required: the general requirements, pages 89-97. Of the 24 semester hours of required courses (exclusive of the thesis), at least six must be in third-group religion courses; a maximum of 12 may be in a closely related field outside the Department of Religion as approved by the department.

*Master of Arts in the field of Religion and Medical Care** Prerequisite: (1) the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree; (2) a first professional theological degree; or (3) acceptable academic work required of entering medical students who have not earned a bachelor's degree, but who are pursuing the degree of Doctor of Medicine.

Required: the general requirements, pages 89–97. The program of study consists of 36 semester hours of approved course work with or without a thesis. Students must elect course work covering four fields selected from clinical pastoral care, religion, sociology, psychology, health care administration and medicine. The course work in these fields must be distributed as follows: 12 semester hours each selected from two fields and at least six hours in clinical pastoral care. The Master's Comprehensive Examination must cover three fields selected from the list above, one of which, as approved by the department, must be outside of the Department of Religion. Supervised clinical education may be offered as a tool subject in lieu of the required reading knowledge examination in a foreign language.

Master of Arts in the field of History of Religions: Hinduism (Consortium of Universities program). Prerequisite: the Bachelor of Arts degree from this University with suitable background in the study of religion of South Asia or an equivalent degree.

Required: the general requirements, pages 89–97. The program of study consists of 24 hours of course work (exclusive of thesis) selected from upper-division and graduate courses of member universities of the Consortium as determined by the Department of Religion, including a sequence of four courses in the literature of the Hindu tradition and one course in method in history of religions. The Master's Comprehensive Examination must cover the following: methods in the study of religions, thematic comparisons between the Hindu tradition and at least two other religious traditions, including at least one Western tradition, and a special field in Hindu tradition. A reading knowledge examination in a foreign language, usually in French or German, will be required, and a student must take at least two semesters of either Sanskrit or Hindi in addition to the 30 hours of required courses for graduate credit. More complete information regarding courses and requirements is available from the program advisor, Associate Professor A. J. Hiltebeitel, Department of Religion.

Doctor of Philosophy in the field of American Religious History (offered in cooperation with the Department of History) Required: the general requirements, pages 89–91, 97–99. The General Examination must cover four fields, including two from the Department of Religion (history of religion in America and either early Christianity or European Christianity since 1500) and two from the Department of History (generally American social history and one other).

First Group

9 The Hebrew Scriptures (3) Jones

Historical and literary study of the Hebrew Scriptures (Old Testa-

* Certain courses in this program are offered only through off-campus centers of the College of General Studies.

ment) with consideration of development of religious ideas, institutions, and outstanding personalities. (Fall and spring)

10 **The New Testament** (3) Jones

Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles. (Fall and spring)

21 **Religion and Man's Search for Meaning** (3) Staff

Traditional religious concepts, language of contemporary religion amidst modern scientific and secular intellectual tendencies, and the place of religion in today's society. (Fall)

22 **Religion and Contemporary Social Issues** (3)

Illumination of social problems by ethical reflection: examination of ethical perspectives as stimuli and barriers to social change; techniques for maintaining social values and seeking change.

23 **Judaism: Identities and Ideas** (3) Altshuler

Exploration of important practices and beliefs in classical and modern times; study of people and texts which confront tradition and change. (Fall)

57 **Eastern Spiritual Movements and the Modern West** (3) Staff

Impact of Eastern religions on Western culture (mainly British and American) through the widening of cultural horizons, the lure of the East, the popularization of the occult, transcendentalism, the "metaphysical movements," and the arrival of gurus and other missionaries from the East. Modern Western influences on Eastern religions as background. (Summer)

59 **Religions of the East** (3) Hiltebeitel

(Formerly History of Religions)

Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto. (Fall and spring)

60 **Religions of the West and Near East** (3) Wallace

(Formerly History of Religions)

History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments. (Fall and Spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

103 **The Prophets** (3) Quitslund

Development of prophetism in the Old Testament; cultural, economic, psychological, and religious factors; elements of lasting value in the prophetic teaching. Study of selected prophets. (Fall)

* An interdepartmental course offered by the Departments of Religion, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Political Science.

104 **The Life and Thought of Jesus** (3) Quitslund
Comprehensive study of the life and teachings of Jesus with critical attention to sources.

105 **The Life and Thought of Paul** (3)
Backgrounds of early Christianity, first-century religious and social conditions affecting the spread of Christianity, the life and journeys of Paul, Paul's presentation of the Christian faith. (Spring)

107 **Rabbinic Literature and Thought** (3) Altshuler
(Formerly Rel 139 Meaning of the Talmund in Jewish Life)
Readings of the Mishna, Talmud, exegetical midrashim and targumin in English translation. Methods of literary and historical analysis introduced and applied. Individual research projects. (Fall)

111 **Myth, Epic and Novel** (3) Hiltebeitel
Religious themes and images of the hero and their cultural significance in literature: e.g., Indo European, Biblical, Babylonian narrative traditions; Greek epic and drama; Dante, Milton, Dostoevsky, Kafka, Hesse, Faulkner, Beckett. (Fall)

113 **Early Post-Biblical Judaism** (3) Altshuler
History of Judaism from Ezra through the destruction of Jerusalem in 70 CE: the canonization of the Pentateuch, Hellenism, Maccabean revolt, growth of sectarian movements, Herod, ferment against Rome in context of Eastern and Western political currents. Use of primary sources, especially the Bible, Josephus, rabbinic and noncanonical writings. (Fall)

114 **Judaism in the Rabbinic Period** (3) Altshuler
From 70 CE through end of rabbinic period. Focus on religious responses to destruction of the Temple: apocalyptic thinking and revolt of Bar Cochba; rabbinic and patriarchal responses to Roman authority; Tannaitic and Amoric Judaism in Palestine and Babylonia; mystical and folk religion phenomena preserved in art and literature. (Spring)

115 **Judaism in the Medieval Period** (3) Altshuler
History of relations with non-Jews. Daily life and education of the ordinary Jew; rabbinical law and interpretation of scripture; Jewish philosophers, mystics, sects and messianic movements.

116 **Judaism after Emancipation** (3) Altshuler
Transformation of community and beliefs among Jews beginning with catalyst of their political emancipation. Responses to beginnings of modernity among Jews in Europe, America and Israel.

122 **Christian Ethics and Modern Society** (3) Yeide
Nature and principles of Christian life as developed by the Christian community; problems of personal conduct; application to family, social, and economic institutions.

124 **Contemporary Movements in Theology** (3) Quitslund
Theological approach and systems of a selected number of modern theologians.

126 **Western Mysticism** (3) Quitslund

Study of the phenomenon of religious experience and of selected mystics in Judaism, Christianity, and Islam. (Spring)

127 **Medicine, Religion, and Healing** (1) Staff

Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious perspective on issues in medical ethics.

137 **The Land of Israel and the Growth of the Western Religions** (6) Staff

143 **Early Christianity and the Spiritual Life of the Ancient World** (3) Wallace

Rise and development of Christianity in relation to the culture, philosophy, mystery religions, and general religious life of the Greco-Roman world to A.D. 500. (Fall)

144 **Medieval Faith and Symbolism** (3) Wallace

Christian life and thought in the Middle Ages: mystics, saints, popes, and philosophers. (Spring)

145 **Religious Currents in the Renaissance and Reformation** (3) Wallace

Transformation of Western man's understanding of his identity and destiny from the end of the Middle Ages to the Age of Reason.

146 **Christianity in the Modern World** (3) Wallace

Changing religious styles and patterns since the Age of Reason as seen in theology, literature, political life, and religious institutions.

157 **Indian Philosophy and Mysticism** (3) Hiltebeitel

Indian speculative and mystical traditions: late *Vedas*, *Upanishads*, *Bhagavad Gita*, Buddhist, and Hindu soteriological systems. (Spring)

158 **Ancient Indian Literature and Religion** (3) Hiltebeitel

Studies of foundational texts of Hinduism, especially *Rig Veda*, *Brahmanas*, *Mahabharata*, (including the *Bhagavad Gita*), attention to Hinduism's archaic and seminal themes. (Fall)

159 **Mythologies of India** (3) Hiltebeitel

The lore of Indian gods (Vedic, Puranic), heroes (epics), and holy men (Hindu, Buddhist, Jain, Tantric); its ties with Indian caste, cult, cosmology, and spiritual ideals.

160 **Buddhism** (3) Hiltebeitel

Origin, development, and contemporary status of Buddhist life and thought; its impact on Asian culture.

161 **Islam** (3)

Origin, development, and contemporary status of Islamic life and thought; its impact on the Near East.

162 **Symbolism in the History of Religions** (3) Hiltebeitel

Religious symbolism, myth, legend, and ritual in the religions of the world; various theoretical analyses.

172 **Religion in American Culture** (3) Wallace
Growth of religious bodies and institutions in relation to American culture, development of religious thought, and analysis of the contemporary religious scene.

174 **American Judaism** (3) Altshuler
Religious thought and institutions with emphasis on contemporary Judaism. Mythic and ritual life of American Jews, including responses to Israel, diaspora, the Holocaust, family and community life. (Spring)

181 **Woman in Western Religion** (3) Quitslund
Historical, theological, and ethical investigation of the image and role of woman in Judaism and Christianity; special consideration of the Biblical experience, the sexual qualifications for religious office, use of male-female images and languages, and contemporary issues. (Fall)

184 **The Thought of Martin Buber** (3) Jospe
Basic principles underlying the Life of Dialogue and application of those principles to all strata of life from interpersonal relationships to the religious realm. (Fall)

199–200 **Proseminar: Readings for the Major** (3–3) Staff
Readings and group discussions. (Academic year)

Third Group

209–10 **Seminar: Biblical Studies** (3–3) Jones
Main problems of Biblical literary, historical, and theological criticism. (Rel 209—fall; Rel 210—spring)

213 **Seminar: Inter-testamental Judaism** (3) Jones
Historical and religious development of Judaism as seen in the Apocrypha, Pseudepigrapha, Dead Sea Scrolls, Philo and early Rabbinism.

*216 **Supervised Clinical Pastoral Education (I–A)** (6) Staff
Full-time program of clinical pastoral education in an approved center. Involvement in the responsibility for pastoral ministry is reviewed and evaluated in a peer-group context

*217 **Supervised Clinical Pastoral Education (I–B)** (6) Staff
Continuation of Rel 216 with emphasis on pastoral and personal identity, sustained pastoral relationships, and pastoral methods and skills.

*218 **Supervised Clinical Pastoral Education (III–A)** (6) Staff
Responsibility in pastoral ministry is increased with emphasis on group work, interprofessional involvement, use of specific counseling methods, work with persons with special problems. Prerequisite: Rel 216 and 217; or equivalent.

*219 **Supervised Clinical Pastoral Education (III–B)** (6) Staff
Continuation of Rel 218 with emphasis on examination and review of

* Offered through the College of General Studies at off-campus centers for students in the master's degree program in the field of religion and medical care.

administrative procedures, design of pastoral programs, and development of pastoral theology.

222 **Seminar: Christian Ethics** (3) Yeide
Important tendencies in ethical reflection of the contemporary Christian Church; contributions of social sciences to that reflection.

*223 **Religious and Ethical Perspectives on Medical Problems** (3) Yeide
Religious and ethical questions in medical problems and medically related issues.

*225 **The Dynamics of Ministering to the Young Adult** (3)
Conceptual models of development of young adults from late adolescence; special problems of educational and military experience, vocational choice, marriage and the family, and physical, intellectual, emotional, and religious development. Encounter experience with persons and groups.

*227–28 **Advanced Studies in Pastoral Care** (3–3)
History and present state of methodologies and conceptual models of pastoral counseling and leadership in groups, supervised work in interfaith and multidisciplinary ministries

235 **Seminar: Roman Catholicism in the Modern World** (3) Quitslund
Important leaders and their ideas in selected development since 1500—doctrinal, spiritual, biblical, liturgical, and ecumenical.

237 **Seminar: Theological Analysis** (3) Quitslund
Historical and topical study of the development of important ideas in such areas as Christology, soteriology, and ecclesiology. (Fall)

238 **Seminar: Contemporary Jewish Religious Thought** (3) Altshuler
Selected topics. (Spring)

262 **Seminar: History of Eastern Religions** (3) Hiltebeitel
Selected topics. (Spring)

271 **Seminar: American Religious History to 1830** (3) Wallace
Religious thought and life during the Colonial and early National period. (Spring)

273 **Seminar: American Religious History since 1830** (3) Wallace
Religious thought and life from the Civil War to the present.

291–92 **Readings and Research** (3–3) Staff
Investigation of special problems. (Academic year)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

OMANCE LANGUAGES AND LITERATURES

rofessors J.W. Robb, G.E. Mazzeo *(Chairman)*, J.A. Frey, J.L. Métivier, Jr., J.F. Burks

ffered through the College of General Studies at off-campus centers for students in the aster's degree program in the field of religion and medical care.

Associate Professors M.A.B. Coffland, P.G. Sáenz, G. Ludlow, S.R. Barnett
Assistant Professors G.P. Huvé, J.E. Hicks, I. Azar, J.M. Thibault, J.M. Tubbs

Bachelor of Arts with a Field-of-Study major in (1) French language and literature, (2) Spanish-American literature, (3) Spanish language and literature, or (4) any approved combination selected from two of the preceding fields. **The following requirements must be fulfilled:**

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social studies and the natural and mathematical sciences.)

2. Prerequisite courses: Fren 1–2, 3–4, 9–10, or equivalent; or Span 1–2, 3–4, 9–10, or equivalent.

3. Required introductory literature courses—Fren 51–52 or 91–92, or Span 51–52 or 91–92.

4. Required for the major:

There is no specific program of required courses. The student, however, is expected to demonstrate a knowledge of his or her field in breadth and depth either by passing a comprehensive examination at the end of the senior year or by satisfactorily completing a comprehensive project during the course of the senior year. A proseminar is required as follows: Fren 199–200 for French language and literature majors; Span 199–200 for Hispanic language and literature majors.

***Master of Arts in the fields of (1) French literature, (2) Spanish-American literature, (3) Spanish literature, or (4) an approved combination of Spanish and Spanish-American literatures*—Prerequisite: the degree of Bachelor of Arts in the appropriate field from this University, or an equivalent degree.**

Required: the general requirements, pages 89–97. The program of study consists of 24 semester hours of approved coursework plus a thesis (equivalent to six semester hours), or, with the approval of the department, a student may elect a program of study consisting of 36 semester hours of approved coursework without a thesis.

***Doctor of Philosophy fields of study in Romance literatures*—Required:** the general requirements, pages 89–91, 97–99. There are four fields: French literature, Spanish literature, Spanish-American literature, and any approved combination of French, Spanish, or Spanish-American literature.

Bachelor of Arts in Education with teaching fields in French and in Spanish. Prerequisite: the education curriculum, pages 111–12.

Required: the French option or the Spanish option and the professional courses listed on pages 115–16.

Placement Examinations: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

FRENCH

Departmental prerequisite: Fren 3–4 or 6, or equivalent, is prerequisite to second-group courses in French, except for courses offered in English translation.

First Group

1–2 **First-year French** (3–3) Tubbs and Staff

A year course; credit toward a degree at this University given on completion of Fren 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. **Laboratory fee, $17.50 a semester. (Fren 1 and 2—fall and spring)**

3–4 **Second-year French** (3–3) Thibault and Staff

A year course: credit toward a degree at this University given on completion of Fren 4. Conversation, grammar, composition, reading in modern French prose. Oral practice in language laboratory. Prerequisite: Fren 1 2 or two years of high school French. Laboratory **fee, $17.50 a semester. (Fren 3 and 4—fall and spring)**

6 **Second-year French** (6) Thibault and Staff

Lecture (3 hours), discussion (3 hours). Intensive course which covers material of Fren 3 4. Prerequisite: two years of high school French with grades of *B* or better; Fren 2. Laboratory fee, $17.50 a semester. (Spring)

9 **Expression orale du français contemporain** (3) Huvé and Staff

Emphasis on conversation in a controlled situation. Special attention to the acquisition and active use of a flexible vocabulary. Oral reports. Prerequisite: Fren 3 4 or equivalent. (Fall and spring)

10 **Cours de Syntaxe** (3) Huvé and Staff

Grammar, composition, study of vocabulary and syntax. Prerequisite: **Fren 3–4 or equivalent. (Fall and spring)**

49 **French for Graduate Students** (0) Staff

For graduate students preparing for reading examinations. No academic credit. Total fee, $329 25 (tuition, $315; University Center fee, **$14.25). (Fall and spring)**

51–52 **Survey of French Literature** (3–3) Métivier and Staff

Readings in French literature from the Middle Ages to the present. Lectures, readings, and informal discussions. (Fren 51 and 52—**fall and spring)**

60 **Contemporary French Civilization** (3) Ludlow

Study of contemporary France as seen through its cultural, political, economic and social life, its geography, language, population and character. Class lectures and discussion of texts supplemented by slides, films, tapes and records. Conducted in English.

91–92 **Analyse de texte** (3–3) Thibault

Methodology and vocabulary of literary criticism; application of principles of *explication de texte* to selections from prose, drama, and poetry from the Renaissance to the present. (Academic year)

Second Group

103 **Diction, Phonétique appliquée** (3) Huvé

The sound of French; elements of articulatory phonetics. Exercises

in reading and speech with attention to pronunciation, accent rhythm, and intonation. (Fall)

108 **Cours de grammaire avancée** (3) Thibault
(Spring)

109 **La Langue pratique** (3) Huvé and Staff
Advanced level study. Practical and everyday vocabularies develope through systematic drills of syntactical patterns. (Fall and spring)

110 **Cours de stylistique** (3) Huvé and Staff
Advanced study of vocabulary and syntax with emphasis on stylistic devices and techniques of translation. (Fall and spring)

119–20 **French Literature of the Middle Ages and the Renaissance** (3–3) Métivier
Literary history and the development of ideas. *Les chansons de geste*, courtly literature, satire, the theater, lyric and didactic poetry, Rabelais, Montaigne, La Pléiade. Class analysis of texts, collateral readings. (Academic year)

121–22 **17th Century French Literature** (3–3) Burks
Drama, fiction, poetry, criticism and philosophy in the Age of Classicism.

123–24 **18th Century French Literature** (3–3) Ludlow
History, philosophy, criticism, letters, drama, fiction, poetry, the "salons," idea of progress, idea of science. Class analysis of texts, collateral reading. (Academic year)

125–26 **19th Century French Literature** (3–3) Frey, Thibault
Poetry, drama, and novel of the 19th century; emphasis on stylistic analysis. Offered in French, 1977–78 and alternate years; offered in English translation, 1978–79 and alternate years. (Academic year)

127–28 **20th Century French Literature** (3–3) Coffland, Thibault
Fiction, poetry, and drama from 1900 to present. Chronological examination of authors, movements. Offered in English translation, 1977–78 and alternate years; offered in French, 1978–79 and alternate years. (Academic year)

130 **From Cubism to Surrealism: Correspondences between Art and Literature** (3) Coffland
Expression of common preoccupations in diverse media. Readings, slides, lectures, and informal discussions. (Summer)

133 **Seminar: French Literature** (3) Staff
May be repeated for credit. Topic to be announced in the Schedule of Classes. (Summer)

151 **Cinema and Literature—in English** (3) Thibault
Interaction between the film and literature; aesthetic theories of the surrealists and their applications to the film and literary genres. Selected films and readings. May be repeated for credit.

199–200 **Proseminar: Readings for the Major** (3–3) Staff
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

202 **Thème et Version** (3) Ludlow
Limited to students in the Graduate School of Arts and Sciences; open to others only by permission of the graduate advisor. Required of all graduate students in the field of French language and literature. Analysis and translation of selected prose passages, alternating between French and English; designed to teach students to write with precision and clarity. . . . (Fall)

213–14 **Medieval French Literature** (3–3) Burks
French literature to the end of the Middle Ages. Prerequisite: a second-group course in French literature. (213 Fall)

221 **Special Problems in 16th Century French Literature** (3) Burks
May be repeated for credit. Topic for 1978: Rabelais. (Spring)

226 **16th and 17th Century Philosophical Literature** (3) Burks
The emergence of a literature of ideas; emphasis on the thought of Calvin, Montaigne, Descartes, and Pascal.

229–30 **Literary Renaissance in Europe** (3–3) Burks
Study of the developments in the poetry of Italy, France, and England.

231–32 **Theater in the 17th Century** (3–3) Burks
Survey of the development of theatrical arts and the drama. Research papers and reports.

234 **17th Century Nondramatic Literature** (3) Ludlow
Development of the classical doctrine in prose.

241 **The Rationalistic Current in the 18th Century** (3) Ludlow
The contribution of the *philosophes* to the intellectual evolution of France and Europe. (Spring)

242 **Seminar: the French Novel and Theater in the 18th Century** (3) Ludlow

244 **Special Problems in 18th Century French Literature** (3) Ludlow
May be repeated for credit.

253 **Special Problems in 19th Century French Literature** (3) Frey
May be repeated for credit. Topic for 1977: realism. (Fall)

258 **Special Problems in 19th Century French Poetry** (3) Frey
May be repeated for credit. Topic for 1978: Parnassian and Symbolist poetry. (Spring)

264 **Seminar: Modern Period** (3) Coffland
Topic: the novel. May be repeated for credit.

265 **20th Century French Theater** (3) Coffland
(Spring)

266 **20th Century French Poetry** (3) Coffland
Background and development of poetry in the 20th century: *explication de texte* approach. (Fall)

295 **Independent Reading and Research in French Literature** (arr.)
For students preparing for the Master of Arts degree. May be re-peated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. The policies of the Institute are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 309. Seminar titles for the 1977–78 academic year are listed below. Students wishing to register for these courses should consult the Chairman of the Department of Romance Languages and Literatures.

301–308 **Folger Institute Seminar** (3 each)
Topics will be announced.

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ITALIAN

First Group

1–2 **First-year Italian** (3–3) Coffland and Staff
A year course: credit toward a degree at this University given on completion of Ital 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 a semester. (Academic year)

3–4 **Second-year Italian** (3–3) Coffland and Staff
A year course: credit toward a degree at this University given on completion of Ital 4. Conversation, grammar, composition, reading of modern Italian prose, introduction to Italian civilization. One or practice in language laboratory. Prerequisite: Ital 1–2 or two years of high school Italian. Laboratory fee, $17.50 a semester. (Academic year)

9–10 **Italian Conversation and Composition** (3–3) Coffland
Prerequisite: Ital 4 or equivalent and permission of instructor. (Academic year)

11 **Italian through Opera** (3) Chambers
Conversational Italian presented through excerpts from operas and their libretti. Pronunciation and grammatical principles, vocabulary and conversation. (Summer)

Third Group

295 **Independent Reading and Research in Italian Literature** (arr.)
For students preparing for the Master of Arts or Doctor of Philosophy degree. May be repeated for credit. (Fall and spring)

PORTUGUESE

First Group

31–32 **Intensive Portuguese** (3–3) Robb
Prerequisite: knowledge of one other Romance language. (Academic year)

SPANISH

Departmental prerequisite: Span 3, 4 or 6, or equivalent, is prerequisite to all second-group courses in Spanish except for courses offered in English translation.

First Group

1–2 **First-year Spanish** (3–3) Azar and Staff
A year course: credit toward a degree at this University given on completion of Span 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 a semester. (Span 1 and 2—fall and spring)

3–4 **Second-year Spanish** (3–3) Barnett and Staff
A year course: credit toward a degree at this University given on completion of Span 4. Conversation, grammar, composition, reading of modern Spanish prose. Oral practice in language laboratory. Prerequisite: Span 1–2 or two years of high school Spanish. Laboratory fee, $17.50 a semester. (Span 3 and 4—fall and spring)

6 **Second-year Spanish** (6)
Lecture (3 hours), discussion (3 hours). Intensive, accelerated course which covers material of Span 3–4. Grammar review, reading, conversation. Prerequisite: two years of high school Spanish with grades of *B* or better, or grade of *A* or *B* in Span 2. Laboratory fee, $17.50 a semester. (Spring)

9–10 **Spanish Conversation and Composition** (3–3) Hicks and Staff
Prerequisite: Span 4 or equivalent and permission of instructor. (Span 9 and 10—fall and spring)

20 **Prensa y Cultura: Intensive Spanish Conversation** (3) Azar
Intensive conversation organized around specific contemporary topics; illustrated by periodical material, films and interviews. (Summer)

49 **Spanish for Graduate Students** (0) Hicks
For graduate students preparing for reading examinations. No academic credit. Total fee, $329.25 (tuition, $315; University Center fee, $14.25). (Fall and Spring)

51–52 **Survey of Spanish Literature and Civilization** (3–3) Barnett
Social, artistic, and cultural background of Spanish literature. Lectures, readings, recitations, and informal discussions. (Academic year)

91–92 **Explicación de textos** (3–3) Sáenz
Analytical introduction to Spanish and Spanish-American literature. Method demonstrated and practiced on selected passages. (Academic year)

Second Group

109–10 **Advanced Spanish Conversation and Composition** (3–3) Mazzeo
Development of writing and speaking skills. Emphasis on diction and style. Prerequisite: Span 10 or equivalent and permission of instructor. (Academic year)

119 **Medieval Spanish Literature** (3) Azar
Survey by genre of the literature of the Middle Ages.

121–22 **Spanish Literature of the Golden Age** (3–3) Azar
Span 121: Poetry and theater.
Span 122: The novel. (Academic year)

123–24 **Cervantes: Don Quijote** (3–3) Azar
The *Quijote* and the novel as a literary genre: reality and fiction.

125–26 **Modern Spanish Literature** (3–3) Mazzeo
Prose, poetry, and drama of the 18th and 19th centuries. Class analysis of texts, collateral reading, lectures on literature and history

127–28 **Contemporary Spanish Literature** (3–3) Sáenz
Prose, poetry, and drama of the 20th century. Class analysis of texts, collateral reading, lectures on literature and history. (Academic year)

130 **The Modern Spanish Essay** (3) Mazzeo
Development of the Spanish essay from the 16th through the 20th centuries; emphasis on the 18th and 19th centuries. Class analysis of texts, collateral reading and lectures.

133 **Feminist Authors in Hispanic Literature** (3) Mazzeo
Development of feminist themes in Hispanic literature. Class analysis of representative works with readings in Spanish or in English translation. (Summer)

137 **The Spanish Civil War and the Creative Artist** (3) Barnett
Historical and literary study of the Spanish Civil War and the subsequent artistic reaction in Spain, Great Britain, France and the U.S. Taught in English with readings in Spanish, English or French. Staff

141 **New Spanish-American Narrative** (3)
Short stories of Borges, Cortazar, Fuentes, Arreola, Carpentier, García Marquez. Texts in Spanish. Commentary in English or Spanish Robb

143 **Latin America: a Literary-Cultural View** (3)
Contemporary Latin America: its culture and society as seen through its writers. (Summer)

151–52 **The Spanish-American Novel** (3–3) Robb
Development of the novel in Spanish America. Lectures, collateral reading, and class analysis of texts. (Academic year)

155–56 **Spanish-American Literature to 1880** (3–3) Robb
Literature of Spanish America from the colonial period to the latter part of the 19th century. Lectures, collateral reading, reports, and class analysis of important works.

157–58 **Spanish-American Literature since 1880** (3–3) Robb
Literature of Spanish America from 1880 to the contemporary period. Lectures, collateral reading, reports, and class analysis of important works.

199–200 **Proseminar: Readings for the Major in Hispanic Language and Literatures** (3–3) Barnett
Required for all majors. Conferences and group discussions. (Academic year)

Third Group

215 **Seminar: Medieval Literature** (3) Azar
(Formerly Old Spanish Language and Literature)
(Fall)

221 **Seminar: Cervantes' "Don Quijote"** (3) Azar
Cervantes' literary theories, the *Quijote* and its relations with the other *novelas cervantinas* as different modes of representing reality in literary fiction.

224 **Seminar: Special Problems in Spanish Renaissance Literature** (3) Azar
May be repeated for credit.

225 **Seminar: Special Problems in Golden Age Literature** (3) Azar

231 **Seminar: 18th Century Spanish Writers** (3) Mazzeo
Lectures and analysis of principal authors and works; relationships with subsequent literary movements. (Fall)

242 **Seminar: Spanish Romanticism** (3) Mazzeo
Lectures and analysis of principal authors and works. Collateral readings. Problems of origins and developments. (Spring)

244 **Seminar: Naturalism and the Spanish Novel** (3) Mazzeo
Development of Naturalism in 19th century Spain. Analysis of representative works of Pardo Bazán, Clarín, Blasco-Ibáñez and others.

246 **Seminar: Works of Galdós** (3) Barnett
Ideological and stylistic analysis: relationship of Galdós' works to literary movements of the second half of the 19th century.

248 **Seminar: Spanish Lyric Poetry of the 20th Century** (3) Sáenz
Stylistic analysis of the most significant poets from 1898 to the present.

250 **Seminar: Novecentismo y Literatura de Entreguerras** (3) Sáenz
The prose writers: intellectualism and new forms of expression. (Spring)

251 **Seminar: Works of Unamuno and Ortega y Gasset** (3) Sáenz
Study of the thought of Unamuno and Ortega y Gasset: analysis and commentary on the texts. (Fall)

252 **Spanish Literature since the Civil War** (3) Sáenz
Development of the Spanish novel since 1939.

253 **Seminar: Studies in Modern Spanish-American Poetry** (3) Robb
(Spring)

255 **Seminar: Studies in 20th Century Spanish-American Theater** (3) Robb

256 **Seminar: Studies in Mexican Narrative Prose** (3) Robb

261 **Seminar: Studies in the Spanish-American Short Story and Essay** (3) Robb
The Spanish-American short story and essay as artistic forms: selected modern short story writers and essayists. May be repeated for credit.

264 **Seminar: Studies in Recent Spanish-American Fiction** (3) Robb

266 **Seminar: Alfonso Reyes: Essayist, Poet, Narrator** (3) Staff

287 **Seminar: Problems in Latin-American Civilization** (3)
Interdisciplinary seminar partially guided by a specialist within the methodology of his chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

295 **Independent Reading and Research in Spanish and Spanish-American Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SANSKRIT

See **Germanic Languages and Literatures.**

SCANDINAVIAN

See **Germanic Languages and Literatures.**

SERBO-CROATIAN

See **Slavic Languages and Literatures.**

SERVICE-LEARNING PROGRAM*

Marshall Davies, *Coordinator*
Professor C.C. Mondale
Associate Professor M. McCally
Assistant Professors H. Nashman, N.C. Garner
Lecturer G.H. Williams

151 Urban Legal Services (6) **Williams†**

Field work and academic study of the urban legal system. Role of urban legal system in promoting humanistic values and enhancing social change. Admission by permission of instructor. (Fall and spring)

152 Human Resource Issues in Education (6) Nashman

Exploration of the effects of education on society and vice versa; opportunities for experience, study and service in public, private, museum, hospital and community education centers. Admission by permission of instructor. (Fall and spring)

153 Issues in American Health Care (6) McCally

Field work combined with academic study of present American health care system and its problems: cost, quality of care, delivery of health care, ethical issues, health education, consumer issues, etc. Field placements (12–20 hours a week) in appropriate health-related activities. Admission by permission of instructor. (Fall and spring)

154 Independent Study (3 or 6) **Davies**

Field work combined with academic study involving field-placements (15-20 hours a week) and complementary academic program of study, under the supervision of an appropriate faculty member. Students must "contract" with the agency, the faculty member and the Service-Learning Program. Admission by permission of instructor. (Fall and spring)

155 The Arts and their Audiences (6) Garner

Studies in the purpose and operation of the arts organizations in

* Administered by the Division of Experimental Programs.
† Gregory Howard Williams is Lecturer in Law in the University's National Law Center

Washington. Weekly seminars and placement in an internship in an arts organization. Discussion topics focus on the process of communication between artists and the public, the government and the business community. Open to students with a demonstrated interest in the arts and the maturity to perform in a responsible position in an arts organization. (Spring)

SERVICE-LEARNING POLITICAL SCIENCE

154 Law and Social Change (6) Williams*

Study of the legal system and its role in promoting social change. Readings, group discussions and field placements. (Fall and spring)

155 American Political Behavior (6) Staff

Internship in a variety of lobbying groups. Analysis of the structural and behavioral limitations which confront those who wish to exercise political influence. (Fall and spring)

SINO-SOVIET STUDIES

See **Institute for Sino-Soviet Studies.**

SLAVIC LANGUAGES AND LITERATURES

Professors H.B. Yakobson, C.A. Moser
Associate Professors N.N. Natov, G.A. Olkhovsky *(Chairman)*, W.W. Rowe, I. Thompson, M. Launer *(Visiting)*
Adjunct Assistant Professor M.F. Miller
Lecturers S. Ficks, M.S. Watson

Bachelor of Arts with a major in Russian Language and Literature (Field-of-Study or Departmental)—The following requirements must be fulfilled.

1. The general requirements as stated on pages 73–74, 80–86.

2. Prerequisite courses—Slav 5–6 (preferred), or Slav 1–2, 3–4; or equivalent: and Slav 91 92.

3. Required for the major:

Field-of-Study major—By the end of the senior year the student will be expected to have a reasonable command of language skills and a grasp of the fundamentals of Russian structure, as well as a good foundation in Russian literature and culture. The passing of a major examination during the senior year is required. The department provides a proseminar to assist the student **in preparation for the major examination.**

Departmental major—from 30 to 36 semester hours of course work in the Department of Slavic Languages and Literatures distributed as follows: Language—12 to 15 hours chosen from Slav 9 10, 101, 103, 104, 109 10, 198; Culture and Civilization—six hours chosen from Slav 71, 161 62, 172. Literature in Russian—six hours chosen from Slav 141 42, 151 52; Literature in English Translation—six to nine hours chosen from second-group courses.

A student who is already proficient in Russian language or literature may

* Gregory Howard Williams is Lecturer in Law in the University's National Law Center

upon passing an appropriate examination, waive any or all of the first-group language or literature courses, as well as up to six semester hours of second-group courses.

Bachelor of Arts with a major in Russian Literature and Culture—in Translation (Field-of-Study)—The following requirements must be fulfilled.

1. **The general requirements as stated on pages 73–74, 80–86.**
2. Prerequisite courses: Slav 47 and 49, or Slav 1–2 and 3–4, or equivalent; and Slav 91–92.
3. By the end of the senior year the student will be expected to have a good grasp of Russian literature and the principles of literary criticism, as well as a general knowledge of Russian culture and history. The passing of a major examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.

A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive any or all of the first-group language or literature courses, as well as up to six semester hours of second-group courses.

Master of Arts in the field of Russian Language and Literature—Two areas of concentration are offered: Russian language and literature and Russian language and linguistics.

Prerequisite: the degree of Bachelor of Arts with a major in Russian language and literature or Russian literature and culture—in translation from this University, or an equivalent degree. A student planning a concentration in Russian language and literature must have a general proficiency in the Russian language, a general knowledge of Russian literature and an acquaintance with Russian history and culture. A student planning a concentration in Russian language and linguistics must have a general proficiency in the Russian language, a general knowledge of its structure and an acquaintance with general linguistics.

Required: the general requirements, pages 89–97. The program of study consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) or 30 semester hours of approved course work without a thesis. Candidates electing the Russian language and literature concentration must include six semester hours of linguistics and at least 18 hours of literature; candidates electing the Russian language and linguistics concentration must include six semester hours of literature and at least 18 hours of language and linguistics. All candidates must pass a reading knowledge examination in either French or German and must pass a Master's Comprehensive Examination.

Bachelor of Arts in Education with a teaching field in Russian—Prerequisite: the education curriculum, pages 111–12.

Required: the Russian option and the professional courses listed on pages 115–16.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

First Group

1–2 **First-year Russian** (3–3) Yakobson and Staff

Beginners' course in fundamentals of grammar and pronunciation. Slav 1 is prerequisite to Slav 2. Laboratory fee, $17.50 a semester. (Slav 1 and 2—fall and spring)

3–4 **Second-year Russian** (3–3) Yakobson and Staff

Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1 2 or two years of high school Russian. Prerequisite to Slav 4 Slav 3. Laboratory fee, $17.50 a semester. (Academic year)

5–6 **Intensive Beginning Russian** (6–6) Thompson and Staff

Classroom (7 hours), laboratory (1 hour). Beginners' intensive course in the fundamentals of Russian. Prerequisite to Slav 6: Slav 2 or 5 Laboratory fee, $17.50 a semester. (Academic year and summer)

7 **Intensive Russian Conversation** (6) Olkhovsky and Staff

Concentrated practice in spoken Russian. Prerequisite: Slav 4 or 6 or permission of instructor.

9–10 **Intermediate Russian Conversation and Composition** (3–3) Yakobson

Listening comprehension; oral and written practice. Prerequisite: Slav 4 or 6, or permission of instructor. (Academic year)

31–32 **Elementary Polish** (3–3) Staff

Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 32: Slav 31 or equivalent. Laboratory fee, $17.50 a semester. Offered if enrollment is sufficient.

41–42 **Elementary Serbo-Croatian** (3–3) Staff

Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 42: Slav 41 or equivalent. Offered if enrollment is sufficient.

47 **Beginning Russian for Reading** (3) Miller

For undergraduate and graduate students with little or no Russian who wish to acquire a reading knowledge of the language. No academic credit for graduate students. (Fall and summer)

49 **Russian Reading** (3) Miller

Primarily for graduate students preparing for reading examinations. No academic credit for graduate students. Prerequisite: Slav 47 or equivalent. (Spring and summer)

51–52 **Elementary Bulgarian** (3–3) Moser

Beginners' course in fundamentals of grammar and pronunciation. Prerequisite to Slav 52: Slav 51 or equivalent. Offered if enrollment is sufficient.

71 **Introduction to Russian Civilization** (3) Olkhovsky

Survey of Russia's artistic, social, and cultural development. Lectures, discussion, visual aids in English. (Fall)

91–92 **Introduction to Russian Literature** (3–3) Moser

Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English. (Academic year)

Second Group

101 **Readings in the Soviet Press** (3) Staff

Representative reading and translation of Soviet periodicals and

current publications in social sciences. Prerequisite: Slav 4, 6, 49, or permission of instructor. (Fall)

103 **Scientific Russian** (3) Staff

Representative readings in the major fields of Russian contemporary scientific literature. Prerequisite: Slav 4, 6, 49, or permission of instructor. (Spring, even years)

104 **Business Russian** (3) Staff

Study of Russian business vocabulary and concepts of business in the Soviet context. Prerequisite: Slav 4, 6, 49, or permission of instructor. (Spring, odd years)

109–10 **Advanced Russian Conversation and Composition** (3–3) Yakobson

Developing proficiency in oral and written expression. Prerequisite: Slav 10 or equivalent. (Academic year)

128 **Dostoevsky, the Man and the Artist** (3) Natov

Sources and development of Dostoevsky's philosophical, religious, and aesthetic ideas. His influence on Russian and Western literature. Lectures, discussions, and reports—in English. (Fall)

141–42 **19th Century Russian Literature** (3–3) Staff

Major Russian writers and literary trends from the end of the 18th century to Chekhov: fiction, poetry, drama—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Academic year 1978–79 and alternate years)

143–44 **The Russian Novel** (3–3) Moser

Study of representative novels of the 19th and 20th centuries—in English. (Academic year 1978–79 and alternate years)

146 **The Russian Short Story** (3) Natov

Historical development of the Russian short story. Lectures, reports, and class analysis—in Russian. (Spring, odd years)

151–52 **20th Century Russian Literature** (3–3) Natov

Various trends in Russian literature since the beginning of the 20th century. Masterpieces of Russian poetry, prose, and drama—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Academic year 1977–78 and alternate years)

156 **Leo Tolstoy, His Life and Works** (3) Rowe

Evolution of Tolstoy's artistic and philosophical ideas. Tolstoy's impact on Russian literature and society. Lectures, reports, and classroom analysis of his major works—in English. (Spring)

157 **Nabokov** (3) Rowe

Reading and discussion of the major creative works. Russian roots, ordering of reality, sexual symbolism—in English. (Fall)

158 **Solzhenitsyn** (3) Staff

Reading and discussion of the most important stories, novels, and plays by the outstanding contemporary Russian writer—in English. (Spring, even years)

161–62 **Russian Culture** (3–3) Olkhovsky

Survey of Russian cultural heritage from origins of ancient Russia

to present in English. Lectures, discussion, reports. (Academic year)

165 **Soviet Literature from the Revolution to World War II** (3) Natov
Basic themes, issues, literary figures of the Soviet 1920s. The fate of literature and writers under increasing state control; Five-year Plan literature. Lectures, discussion, reports—in English. (Fall)

166 **Soviet Literature from World War II to the Present** (3) Natov
Literature in wartime, under Stalinism, and in the "thaws." The new generation of dissident liberal and "underground" literature. Lectures, discussion, reports—in English. (Spring)

172 **Soviet Dissent** (3) Olkhovsky
Examination of artistic and intellectual dissent since the death of Stalin; underground press, songs, plastic arts—in English. (Spring)

178 **Women in Russian Literature** (3) Staff
The unique role of women in Russian literature. Reading and discussion of major works by Russian women writers—in English. (Spring, even years)

191 **Russian Literature to 1800** (3) Moser
Survey of Russian literature from the earliest times to the end of the 18th century—in English.

193–94 **The Other Slavs: Their Literature** (3–3) Moser
Taught in English. An examination of non-Russian Slavic literatures from their beginnings to the present day. Emphasis on themes, ideas, and styles peculiar to each literature.

195 **Special Problems in Russian** (3) Staff
Detailed study of more difficult characteristics of the Russian language: verbal aspects, the case-preposition system, intonational semantics, and syntax.

197 **Methodology of Teaching Russian** (3) Thompson
Discussion of methods, examination of textbooks, observation of classroom procedures. Prerequisite: 18 semester hours of Russian language. (Fall, even years)

198 **Russian Stylistics** (3) Natov
Development of the Russian language, literary styles, and techniques words and their aesthetic value, phraseological units, word order, phrase structure. (Spring, odd years)

199–200 **Proseminar: Readings for the Major** (3–3) Staff
Conferences and group discussions. (Academic year)

Third Group

213 **Russian Linguistic Structure I: Phonology and Morphology** (3) Thompson
Linguistic description of the phonology and morphology of standard contemporary Russian.

214 **Russian Linguistic Structure II: Syntax, Lexicon, and Semantics** (3) Thompson

Linguistic description of the syntax, lexicon, and semantics of standard contemporary Russian. (Spring)

215 **History of the Russian Language** (3) Thompson

Historical phonology, morphology, and syntax of the Russian language. (Fall, odd years)

216 **Comparative Slavic Structure** (3) Thompson

Study of the structure of Slavic languages other than Russian. Knowledge of a Slavic language other than Russian is helpful, but not required. (Spring, even years)

225 **Pushkin and the Poets of His Time** (3) Natov

Pushkin's predecessors; Pushkin's lyrics and dramas. Lermontov—the heir to Pushkin's poetic tradition. (Fall, odd years)

253 **Seminar: Literary Criticism** (3) Natov

Study of leading Russian critics and their role in the development of Russian literature; the emergence of various literary schools. (Spring, even years)

254 **Seminar: Literary and Intellectual Currents of the 1860s** (3) Moser

Discussion of literary and intellectual developments in the Russia of the 1860s. Reading knowledge of Russian required. (Spring, odd years)

255 **Seminar: Main Trends in 20th Century Russian Literature** (3) Natov

Study of representative works since 1900; their artistic and social value—in Russian. (Fall, even years)

295 **Independent Reading and Research** (arr.) Staff

For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)

(Fall and spring)

SOCIOLOGY

Professors R.W. Stephens, I.H. Cisin, R.G. Brown, T.F. Courtless, Jr. *(Chairman)*, P.H.M. Lengermann, R.A. Wallace
Associate Professor J. Helmer
Assistant Professors P.L. Stewart, J.L. Tropea, M.E. Boeckmann
Adjunct Assistant Professor E.R. Zeitz

Bachelor of Arts with a major in Sociology (Departmental) The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students must consult the departmental advisor regarding course to be taken in satisfying the requirement for meaningful initiation into the Humanities and the Natural and Mathematical Sciences.)

2. Prerequisite course—Soc 1.

3. Required courses in related areas—12 semester hours in one of the following related social science fields: anthropology, economics, geography, history, political science, or psychology.

4. Required courses in the major—Soc 101, 140-41, 149; 15 additional semester hours in second-group sociology courses.

Master of Arts in the field of Sociology—Prerequisite: a bachelor's degree with a major in sociology or in an approved related field. Applicants should present scores on the Graduate Record Examination, especially in the Verbal and the Quantitative Tests, and arrange for former professors to write letters of reference to the Graduate School of Arts and Sciences.

Required: the general requirements, pages 89-97. With the approval of the advisor and of the Graduate Education Committee, students may elect one of the following programs: (1) at least 24 semester hours of graduate work plus a thesis (equivalent to six semester hours), satisfactory completion of a Master's Comprehensive Examination in sociological theory and social research methods and an oral defense of the thesis; or (2) at least 33 semester hours of graduate course work and satisfactory completion of a Master's Comprehensive Examination in sociological theory, social research methods, and one substantive special field (deviant behavior, political sociology, sociology of work, urban sociology, or sociology and social policy). Fifteen semester-hours of elective courses must be interrelated in a logical way to form a subspecialization, and may be taken outside of the department.

In addition to the hours specified above, all candidates must satisfactorily complete Stat 105 or its equivalent. All candidates must select from the graduate sociology courses as follows: six hours chosen from sociological theory (Soc 238 and 239 recommended), six hours chosen from social research methods, and six hours chosen from one special area (deviant behavior, political sociology, sociology of work, urban sociology, or sociology and social policy). Candidates must also fulfill the tool requirement by passing a reading knowledge examination in one foreign language or by satisfactorily completing the tool requirement in either statistics or computer programming.

Doctor of Philosophy in the field of Sociology—Required: the general requirements, pages 89–91, 97–99. Students must complete from 30 to 36 semester hours of graduate course work, and from 12 to 18 semester hours of dissertation research, for a total of 48 hours beyond the master's degree. Students must include in their program of study graduate course work in each of the following: six semester hours of sociological theory (including Soc 333), six hours of social research methods and six hours each in two substantive specialties, at least one of which must be chosen from among those offered by the Department of Sociology—deviant behavior, political sociology, sociology of work, sociology and social policy, and urban sociology. Students must satisfactorily complete the General Examination in sociological theory, social research methods, and two substantive specialties. Students must also fulfill the tool requirement by passing a reading knowledge examination in one foreign language and by satisfactorily completing the tool requirement in either statistics or computer programming.

Departmental prerequisite: Soc 1 is prerequisite to all second- and third-group courses in Sociology except for Soc 181 and 191.

First Group

1 Introductory Sociology (3) Staff

General principles of sociology; development of culture and per-

sonality, impact of groups and institutions on man's social behavior. (Fall and spring)

2 **Major Social Issues** (3) Staff

Critical examination of selected major social issues confronting American society. Topics change each semester. May be repeated once for credit. Prerequisite: Soc 1. (Fall and spring)

Second Group

101 **Development of Social Thought** (3) Lengermann, Stephens

Examination of concepts and theories relevant to the nature of society and human relationships from ancient writings to the 20th century. Prerequisite: Soc 1. (Fall and spring)

124 **Medical Sociology** (3) Brown

Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services. (Fall)

125 **Sociology of Religion** (3) Wallace, Yeide

Introduction to history of the religious area of sociology; analysis of reciprocal impact of secular upon religious and religious upon secular institutions. (Fall)

126 **Urban Sociology** (3) Helmer

Place of the city in larger society; growth of the city, problems of urban living, group life, personality, urban housing, city planning, and suburban development. (Fall)

128 **Urban Problems and Policies** (3) Helmer

Seminar on urban problems and the policies developed in response to them; special focus on Washington, D.C.; students placed in Washington agencies; seminar sessions devoted to social-policy analyses of the students' experiences. (Spring)

129 **Race and Minority Groups** (3) Tropea

Analysis of relationships between dominant and minority groups in society, particularly in the United States, nature and range of problems; analysis of the phenomenon of prejudice. (Spring)

130 **Class, Status, and Power** (3) Stephens

Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies which affect these distributions. (Fall)

132 **Political Sociology** (3) Helmer, Lengermann

Analysis of problems involved in the study of power relations in society; distribution of power in society; types and processes of government; political participation and political mobilization. (Fall)

133 **Sociology of Education** (3) Wallace, Tropea

Analysis of educational systems from institutional perspectives and as agencies of socialization; relationships of education in general to

society, including technological, communal, and subcultural components. (Spring)

135 **Juvenile Delinquency** (3) Courtless, Tropea

Factors producing delinquency; juvenile detention, the juvenile court, training schools, treatment of offenders. (Spring)

136 **Criminology** (3) Courtless, Tropea

Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society. (Fall)

137 **Sociology of Law** (3) Courtless

Law as a social phenomenon and agency of social control. Problems of legal concepts, doctrines and institutions. (Fall)

139 **Society and the Deviant** (3) Tropea

Analysis of relationships of society, socialization, and deviancy. Social responses to deviancy and criminal offenders: rehabilitative programs in community, courts, and schools. (Spring)

140–41 **Social Research Methods** (3–3) Boeckmann, Cisin

Soc 140: introduction to basic research methods in sociology. Soc 141: advanced research methods. Prerequisite to Soc 141: Soc 140. (Soc 140 and 141—fall and spring)

143 **Social Movements** (3) Stephens

General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions. (Spring)

144 **Public Opinion and Mass Communication** (3) Cisin

Communication process with emphasis on international communications, propaganda, and mass media; measurement of propaganda campaigns. (Fall)

149 **Modern Sociological Theory** (3) Wallace, Lengermann

Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. Prerequisite: Soc 101. (Fall and spring)

151 **Problems of Urban Social Systems** (9) Staff

Developing a comprehensive perspective on selected social problems through lectures and readings. Topic changes each semester. Prerequisite: 24 semester hours selected from economics, history, political science, psychology, and sociology. Admission by permission of instructor. Concurrent registration in Soc 152 required. (Fall)

152 **Problems of Urban Social Systems—Supervised Field Work** (6) Staff

Accompanies Soc 151. A maximum of 24 hours a week will be spent in service-research efforts by placement in the Washington, D.C., area. Concurrent registration in Soc 151 required. (Fall)

*153 **Poverty in America** (3) Boeckmann

Exploration of social and economic causes of poverty in the United

* Interdepartmental course offered by the Departments of Sociology and Economics.

States and evaluation of anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low income groups.

155 **Women, Sex Roles, and Socialization** (3) Wallace

Analysis of the social-structural and personality theories and empirical research on sex role socialization in contemporary society. Topics include sexual inequality, women's changing place in the occupational structure, and social change and the women's movement. (Fall)

160 **Death and Dying: A Sociological Perspective** (3) Zeitz

Processes of death and dying examined from cross-cultural and national perspectives. Topics include considerations of terminal care, abortion, murder, funeral customs, genocide, and the depiction of death in literature and philosophy. (Spring)

181 **Major Social Processes** (3) Staff

Analysis and examination of various processes in society of general importance to the field of sociology, e.g., social conflict, socialization, social change, etc. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. (Fall and spring)

191 **Current Emphases in Sociology** (3) Staff

Analysis and evaluation of recent developments in the general field of sociology. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. (Fall and spring)

195 **Research** (1, 2, or 3) Staff

(Formerly three credits)

Independent study and special projects. Open only to selected undergraduate students with promising academic records. Before students are permitted to register for Soc 195, they must submit a written proposal of their plan of study for the approval of the staff member of the department who will be directing their research. (Fall and spring)

Third Group

203 **Social Organization** (3) Wallace, Brown

Introduction to sociological concepts and perspectives on society as a system of institutions. Recommended for students offering sociology as a supporting field. (Fall)

210 **Theoretical Foundations of Political Sociology** (3) Lengermann

Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict, and change. (Fall)

212 **Seminar: Political Processes** (3) Lengermann, Boeckmann

Sociological studies of political process in the United States; distributions of power; political socialization, attitudes, participation, communication; social movements. Prerequisite: Soc 210. (Spring)

220 **Religious Institutions in Urban America** (3) Wallace, Yeide

Structural variety of religious institutions and patterns of interaction

between religious and secular institutions in contemporary urban life. (Spring, even years)

223 Urban Sociology (3) **Helmer**
Sociological perspectives on urbanization and urbanism and on the determinants of the forms and structure of the city. (Fall)

224 Urban Life (3) **Helmer**
Examination of differentiation—social, cultural, areal; life styles, territorial groupings, community participation. Prerequisite: Soc 223. (Spring)

230 Sociological Research Methods (3) Boeckmann, Cisin
Systematic survey of sociological research strategies and review of the literature in this area. Recommended for students with only one undergraduate course in research techniques. Prerequisite: Soc 141 or equivalent. (Fall)

231 Seminar: Advanced Research Methods (3) Boeckmann, Cisin
Intensive study and evaluation of a few sophisticated research techniques and of new developments in the methodology of social research. Prerequisite: Soc 230 or equivalent. (Spring)

232 Seminar: Research Planning and Execution (3) Cisin, Boeckmann
Clinical review of student research projects; recommended for students engaged in thesis and dissertation research. Prerequisite: Soc 230 or equivalent. (Spring)

235 Seminar: Sociology of Education (3) **Wallace**
Sociological theories on relationships between education and the economic, political, social, and cultural character of society; examination of social factors relating to such topics as educational achievement, the changing functions of educational structures, and the roles of teacher and student. (Spring, odd years)

238 Seminar: Development of Sociological Theory (3) **Lengermann**
Development of sociology from the early 1800s to the 1920s. Intensive analysis of the classical theoretical statements. (Fall)

239 Seminar: Modern Sociological Theory (3) Lengermann, Wallace
Intensive examination and evaluation of contemporary schools of sociological theory in Europe and America. Advanced analysis of theoretical perspectives. Prerequisite: Soc 238. (Spring)

240 Sociology of Work and Occupations (3) **Stewart, Brown**
Analysis of occupational roles and structures; recruitment and training; adjustment problems at various career stages; interrelationships of stratification, life styles, and work roles. (Fall)

241 Sociology of Work and Organizations (3) Stewart, Brown
Theory of complex organizations relative to work in industry, government, and business; examination of basic processes such as decision-making, recruitment, allocation of authority, informal organization and interorganizational relations. (Spring)

242 Seminar: Urban Medical Systems (3) Brown, Stewart
Sociological analysis of various problems in urban medical systems.

e.g., delivery of health care services, interprofessional relationships, community health care, etc. (Spring)

252 **Seminar: Sociology and Social Policy** (3) Boeckmann, Helmer
Concepts, theory and research which demonstrate the applicability of a sociological perspective (for example, views on social systems, roles, formal organization, power, stratification, decision-making, social values) on the policy process. (Fall)

254 **Seminar: Methods in Social Policy Research** (3) Boeckmann, Helmer
Systematic survey of conceptualization, design and practice of evaluation research of social experiments, and of simulation and technological forecasting. Prerequisite: Stat 105, Soc 230, 252, or permission of instructor. (Spring)

*259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) (Same as Law 475[2]) Courtless, Tropea

*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) (Same as Law 476[2]) Courtless, Tropea

262 **Seminar: Police and the Community** (3) Courtless, Tropea
Analysis of contemporary urban law enforcement, including policing "styles," civil disorder, police-community relations, and competing perspectives on the place of police agencies in civil society. (Spring)

263 **Seminar: Law and Society** (3) Courtless
Selected problems in law as an instrument of social policy; emphasis on the organization of legal decision-making processes. (Summer)

265 **Seminar: Criminal and Juvenile Justice Systems** (3) Courtless, Tropea
Development of a systematic perspective on components and relationships constituting the juvenile and criminal justice systems. (Spring, even years)

295 **Research** (arr.) Staff
Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

333 **Seminar: Theory Construction and Application** (3) Tropea
Critical examination of the elements of current theories in the social sciences with the major objective of developing general principles

*Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to one additional semester hour. For description of the courses, see the *National Law Center Bulletin*

of theory construction; consideration of the functions of theory in sociological research. (Fall)

351 **Selected Topics in Sociology** (3) Staff

Intensive investigation of special topics in sociology. May be repeated for credit. The following topic(s) will be offered as the demand requires each fall semester: (1) *Social Research*—causal inference in social research, evaluation research, philosophy of science, etc.; (2) *Political Sociology*—comparative political structures, processes of policy formation, social movements, etc.; (3) *Sociology of Work*—work and public bureaucracies, industrial sociology, etc.

352 **Selected Topics in Sociology** (3) Staff

Intensive investigation of special topics in sociology. May be repeated for credit. The following topic(s) will be offered as the demand requires each spring semester: (1) *Sociological Theory*—study of important theorists such as Marx, Weber, Parsons; important themes such as social change, social control; important schools such as symbolic interactionism, general systems theory; (2) *Urban Sociology*—ecological processes, sub-urbanization, the urban school, race and ethnic relations, and related topics; (3) *Law and Society*—the sociology of law, theories of deviance, and related topics.

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SPANISH

See **Romance Languages and Literatures.**

SPECIAL EDUCATION

Professors P. Botwin *(Chairman)*, R.S. Cottrell, Jr., R.K. Ives
Associate Professor J.R. Shotel
Assistant Professors M.S. Castleberry, L.A. Tsantis, S.J. Little, N.D. Tiscione, N.J.S. Sobel
Instructor J.S. Landy

Programs of study in special education leading to the degrees of Bachelor of Arts in Education, Master of Arts in Education, and Doctor of Education are offered by the School of Education (see pages 101–27).

Second Group

101 **Seminar: Dimensions of the Complementary Teaching Role** (3) Little

Instructional experiences designed to refine the insights and competencies essential for successful operation of the complementary teaching model. (Fall)

102 **Teaching the Child with Special Needs: Methods and Materials** (3) — Little

Laboratory course taught in an elementary public school. Students observe and participate in a demonstration seminar conducted by the instructor. Must be taken concurrently with SpEd 189. (Fall)

103 **Teaching the Child with Special Needs: Creative Programming** (3) — Little

Continuation of SpEd 102. Concentration on the total programming of the child with special needs. Must be taken concurrently with SpEd 190. (Spring)

170 **Interpersonal/Intrapersonal Relationships for Special Education Teachers** (3) — Staff

Consideration of factors leading to successful interaction with children. (Fall)

189 **Preprofessional Practicum: Observing the Special Child in the Regular Class Milieu** (3) — Little

Supervised internship in school setting. Emphasis on intensive study of children with special needs. Must be taken concurrently with SpEd 102. (Fall)

190 **Preprofessional Practicum: Inspecting a Continuum of Special Education Services** (3) — Staff

Observation and participation in various special education settings. Emphasis on exposure to and familiarity with goals and programs of various special education models. Must be taken concurrently with SpEd 103. (Spring)

197–98 **Special Study in Special Education** (3–3) — Little

Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

199 **Practicum in Complementary Teaching** (6) — Little

Supervised teaching internship in a school-based intervention program. Student teaching with children identified as needing special education services. A minimum of 240 clock hours required. Admission by permission of the instructor. (Spring)

200 **Psychosocial Development of Young Exceptional Children** (3) — Tiscione

(Formerly Understanding Young Exceptional Children)

A course designed to illuminate the complex and interactive processes which exist in the relationship between psychosocial development and the developmental process in general. (Fall and summer)

Third Group

201 **Introduction to Special Education** (3) — Botwin

Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accomodate children in a school program. (Fall)

222 **Special Education in the Regular Classroom** (3) Landy
Special techniques and materials for regular classroom teachers to assist children who have learning and/or behavior problems; emphasis on specific, practical strategies and applications. Open to undergraduate seniors and regular classroom teachers (Spring)

230 **Vocational Assessment of the Secondary Level Handicapped Student** (6) Staff
Individual study of methods and materials used in vocational assessment including formal and informal tests to determine vocational interests and aptitudes, academic performance, learning style and behavioral readiness. (Fall)

231 **Selected Vocational Methods and Materials** (3) Eddy
Selected materials and techniques used in teaching and programming for the secondary school level handicapped person in academic, career, leisure, and occupational skill areas. (Fall)

232 **Practicum: Vocational/Special Education** (3) Eddy
Placement in at least three to five different sites offering programs in the areas of pre-vocational, industrial arts, and vocational programming that serve the adolescent student. (Fall)

233 **Curriculum for Vocational/Special Education** (3) Staff
Examples and practice in designing and implementing academic, self-help, career education, pre-vocational, industrial arts, and vocational curriculum skills for the handicapped. (Fall)

234 **Seminar in Vocational/Special Education** (3) Eddy
Weekly seminar dealing with experiences, problems, and concerns encountered during the internship with handicapped adolescents. Must be taken concurrently with Special Education 295 (Spring)

235 **Coordination of Job Placement Programs in Vocational/Special Education** (3) Staff
Examples and programming considerations for the development and coordination of an adolescent job placement program. (Spring)

236 **Postsecondary Career Planning for the Handicapped** (3) Staff
This course will address the on-going process of career decision making by the handicapped person who is completing a secondary school level program. (Spring and summer)

250 **Specialized Techniques and Materials for Diagnostic-Prescriptive Teachers** (3) Landy
Selected materials and techniques used in diagnostic-prescriptive teaching. Must be taken concurrently with SpEd 252. Admission by permission of instructor. (Fall and spring)

251 **Psychosocial Factors in Special Education** (3) Landy
Psychosocial factors significant to the process of the special education school-based consultant. Admission by permission of instructor (Fall)

252 **Practicum for Diagnostic-Prescriptive Teachers** (6) Landy
Supervised school experience in diagnostic-prescriptive teaching. Must be taken concurrently with SpEd 250. Admission by permission

of instructor. A minimum of 280 clock hours required. (Fall and spring)

253 **The Humanizing Curriculum and the Special Education Consultant** (3) — Landy

Curriculum concepts and modifications aimed at enhancing the classroom environment for learning and growth. Admission by permission of instructor. (Fall)

260 **Developmental Assessment of Young Exceptional Children** (3) — Castleberry, Tsantis, Tiscione

(Formerly The Assessment Process: Identification and Psycho-educational Assessment of Young Exceptional Children)

Lectures, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor. (Fall)

261 **Practicum: Methods and Materials for Young Exceptional Children** (6) — Ives, Tsantis, Castleberry, Shotel

Clinical practice in design and implementation of educational strategies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Taught at a demonstration site. Requires eight hours a week in service. (Fall)

262 **Seminar: the Education of Young Exceptional Children** (3) — Castleberry, Tsantis, Shotel and Staff

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship for the education of young exceptional children. Must be taken concurrently with SpEd 292. Admission by permission of instructor. (Spring and summer)

263 **Introduction to the Education of the Severely and Multiply Handicapped Child** (3) — Tiscione

Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experience. (Fall)

264 **Advanced Study in the Special Education of Severely and Multiply Handicapped Children** (3) — Tiscione

Specialized programs, techniques, and methods for teaching children with severe disabilities. (Spring, even years)

265 **Clinical Experience with Multiply Handicapped and Developmentally Disabled Young Children** (3) — Ives

Preliminary field experience designed for students with no experience in early childhood special education. Supervised experience necessary for program articulation. Three week intensive involvement in an early childhood special education setting.

266 **The Development of Language in Young Exceptional Children** (3) — Shotel and Staff

(Formerly Problems in Language Development in Young Exceptional Children)

Introduction to the study of language acquisition and the application of current research on language of handicapped children. (Fall)

267 **The Early Childhood Special Educator: A Survey of Roles and Services** (3) Tsantis, Sobel
(Formerly The Role of the Early Childhood Special Educator)
Examination of the spectrum of roles available in early childhood special education; emphasis on role expectations and psychosocial dynamics of the various settings. (Spring)

268 **The Development of Young Exceptional Children with Emphasis on Handicapped Conditions** (3) Sobel and Staff
Lecture (2 hours), site visitation (3 hours), discussion (1 hour). (Fall)

269 **Multidisciplinary Theory in Special Education** (3) Ives, Sobel, Castleberry
(Formerly Psychosocial Concerns of the Early Childhood Special Educator)
Seminar involving student presentations focusing on sociological and psychological constructs relevant to interpersonal intrapersonal relationships. (Fall)

270 **Adapting the Early Childhood Curriculum to the Young Exceptional Child** (3) Sobel
(Formerly Adapting the Early Childhood Curriculum to Meet Special Needs)
Review of the basic curriculum areas as they relate to the development of readiness skills in special education. (Spring, odd years)

271 **The Interdisciplinary Approach to Planning for the Severely or Multiply Handicapped Child** (3) Staff
Laboratory experience in which students participate as educational members of an interdisciplinary team. (Spring)

273 **Seminar for Special Education Strategist Intern** (3) Ives
Weekly seminar dealing with experiences, problems, and concerns encountered during special education/early childhood strategist internship. Concurrent enrollment in SpEd 293 required. (Spring)

290 **Control and Management Techniques for the Young Exceptional Child** (3) Tscione
(Formerly Control and Management Techniques in the Classroom)
Examination of the theory, techniques, and tools essential for group control. Designed to provide practice as well as familiarity with the various theories of control of human behavior. Admission by permission of instructor. (Fall)

292 **Professional Internship in Education of Young Exceptional Children** (6 or 9) Tsantis, Castleberry, Shotel, Tscione, Sobel
Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. Must be taken concurrently with SpEd 262. (Spring and summer)

293 **Professional Internship for the Special Education/Early Childhood Strategist** (9) Ives
Supervised internship in strategist role, emphasizing diversified multi-dimensional aspects of a special education early childhood program. A minimum of 420 clock-hours is required. Concurrent enrollment in SpEd 273 required. (Spring)

294 **Internship in Diagnostic-Prescriptive Teaching** (9) Landy
Supervised field experience in diagnostic-prescriptive teacher programs. A minimum of 420 clock hours required. Admission by permission of instructor. (Fall, spring and summer)

295 **Professional Internship in Vocational/Special Education** (9) Eddy and Staff
Supervised internship in the vocational/special education of adolescent handicapped youth, emphasizing the diversified, multi-dimensional, and inter-agency cooperative needs for such programming. A minimum of 420 clock hours is required. Must be taken concurrently with Special Education 234. (Spring)

297–98 **Individual Study in Special Education** (3–3) Staff
Individual study or research under guidance of staff member. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

303 **Administration and Supervision of Special Education** (3) Botwin
Philosophy and nature of special education, litigation, program organization, administration, and development. Surveying local-level needs; program evaluation and supervision. Admission by permission of instructor. (Spring)

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3) Castleberry, Sobel and Staff
Theoretical foundations and clinical techniques necessary for the early childhood special educator to successfully counsel parents of handicapped children. (Spring)

350 **The Diagnostic-Prescriptive Teacher** (3) Landy
Rationale, operational models, techniques, and problems relevant to implementation of diagnostic-prescriptive teacher programs. Admission by permission of instructor. (Fall)

351 **Seminar: School-based Consultants in Special Education** (3) Landy
Current practices in regular and special education as they affect the school-based consultant; emphasis on concurrent field experience. Admission by permission of instructor. (Spring)

352 **Seminar: Special Education Consultant Programs in the Schools** (3) Landy
For school-based consultants in special education; focuses on in-school program development and recent trends in processes and procedures. Admission by permission of instructor. (Fall)

360 **Advanced Techniques in the Diagnostic-Assessment Process** (3) Tsantis
Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent. (Summer)

370 **Intrapersonal Dynamics in Special Education** (3) Landy and Staff
Small group exploration of intrapersonal factors essential to understanding roles and interpersonal techniques in teaching exceptional

children. Admission by permission of instructor. (Spring and summer)

Fourth Group

401 **Doctoral Mini-Seminar in Special Education** (1) Staff

Participation in a small group with a selected faculty member; intensive study and discussion of an area of common interest in an informal environment providing for the exchange of ideas and optimum potential for personal and professional growth. Admission by permission of instructor. (Fall)

453–54 **Doctoral Internship: Special Education** (6–6) Staff

Supervised professional internship in college teaching, administration, supervision, or private agency function. Each internship individually arranged. Admission by permission of advisor. (Academic year)

480 **Evaluation in Special Education** (3) Shotel

Application of educational evaluation models to special education situations. Special consideration given to the work of Haines, Popham, Scriven, Stake, Stufflebeam, TABA, and Tyler. Practical application of the theoretical models will be stressed. (Fall)

490 **Departmental Seminar in Special Education** (3) Staff

Provides an opportunity for selected graduate students to develop, refine, and demonstrate their skills and abilities in a small-group setting with fellow students and department faculty. Admission by permission of instructor. (Spring)

491 **Dissertation Research** (arr.) Staff

(Fall, spring, and summer)

SPEECH AND DRAMA

Professors J.W. Hillis *(Director of Speech Pathology and Audiology)*, L.S. Bowling *(Chairman)*, W.M. Reynolds *(Director of Speech Communication)*
Professorial Lecturer G. Herer*
Associate Professors L.S. Bielski, M.D.M. Brewer
Assistant Professors J.R. Regnell, N.C. Garner *(Acting Director of Theater)*, S. Keller *(Director of Forensics)*, V.P. Parady, B.W. Sabelli, M.S. Kernan *(Visiting)*, C.W. Linebaugh
Assistant Professorial Lecturers F. Arant, M.O. Regan

Bachelor of Arts with a major in dramatic art (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social studies and the natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.

* Gilbert Richard Herer is also Professor of Child Health and Development in the University's School of Medicine and Health Sciences.

3. Required courses in related areas—24 semester hours of second-group courses outside the Department of Speech and Drama as approved by the major advisor. (Courses in dramatic literature offered in the classics, English, and foreign language departments are strongly recommended.)

4. Required courses in the major—SpDr 151, 152 or 195, 165–66; 12 additional semester hours in second-group drama courses

Bachelor of Arts with a major in speech communication and broadcasting (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social studies and the natural and mathematical sciences.)

2. Prerequisite courses—SpDr 1, 11.

3. Required courses in related areas—12 semester hours in psychology and/or philosophy as approved by the major advisor; 18 semester hours in a single subject area outside the Department of Speech and Drama as approved by the major advisor.

4. Required courses in the major—SpDr 112, 121, 126; 15 additional semester hours of second-group courses in the Department of Speech and Drama as approved by the major advisor.

Bachelor of Arts with a major in speech pathology and audiology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social studies and the natural and mathematical sciences.)

2. Prerequisite courses—SpDr 1, 11.

3. Required courses in related areas—Psyc 115, 121 and 131 (or their equivalent) plus 15 additional semester hours of second-group courses selected from related areas as approved by the major advisor.

4. Required courses in the major—SpDr 101, 103, 104, 108, 118, 119; six additional semester hours of courses in the Department of Speech and Drama as approved by the major advisor.

Master of Arts in the field of speech pathology and audiology—Prerequisite: the degree of Bachelor of Arts with a major in speech pathology and audiology from this University, or an equivalent degree, and an appropriate score on the Aptitude Test of the Graduate Record Examination.

Required: the general requirements, pages 89–97. The program of study consists of 36 semester hours of approved course work without a thesis or with the approval of the department, 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). All students must satisfy the academic and supervised practicum requirements of the Certificate of Clinical Competence awarded by the American Speech and Hearing Association.

All students must take the National Examination in Audiology or in Speech Pathology available through the Educational Testing Service. Students must request the Testing Service to send copies of the test scores to the department of speech and drama to be used in the fulfillment of the general requirement in the Graduate School of Arts and Sciences for the Master's Comprehensive Examination. Satisfactory test results must reach the department at least three weeks before graduation.

Master of Fine Arts in the field of dramatic art—Prerequisite: the degree of Bachelor of Arts from this University, or an equivalent degree.

Required: the general requirements, pages 89–97. The program of study consists of (1) 30 semester hours of second- and third-group course work planned in consultation with the advisor; (2) a creative thesis (equivalent to

six additional semester hours) in the selected area of concentration. Each candidate is expected to complete the program in residence in four continuous academic-year semesters.

Bachelor of Arts in Education with a teaching field in speech and drama—Prerequisite: the education curriculum, pages 111–12.

Required: the speech and drama option and the professional courses listed on pages 115–16.

Speech and Hearing Therapy: See Speech and Hearing Clinic, page 54.

First Group

1 Communicative Speaking and Listening (3) Reynolds and Staff

Basic theories and principles of speech communication: composition, delivery, and criticism of speaking in interpersonal, group, and public situations. Recording fee, $4. (Fall and spring)

2 Interpersonal Communication (3) Reynolds

Introduction to the role of verbal and nonverbal transactions in spontaneous, face-to-face encounters. Role-playing, models, and simulations. (Summer)

11 Voice and Diction (3) Bielski and Staff

Development of naturalness, correctness, and clarity in conversational speech. Analysis and correction of individual speech delivery faults through tapes and weekly performances. Recording fee, $4. (Fall and spring)

32 Oral Interpretation of Literature (3) Staff

Practical work in translating literature into the spoken word. Interpretation of prose, poetry, and drama. Recording fee, $4. (Fall and spring)

45 Understanding the Theater (3) Parady

The art of the theater: its literature, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer examined through lectures and class discussion. Attendance at theatrical performances and presentations by visiting artists. Primarily for nonmajors. (Fall and spring)

49 Rhetoric in Political and Social Action (3) Reynolds

Study of the use and abuse of rhetoric in contemporary political and social movements. Influence of speech communication on opinion-making, examined by means of readings, guest speakers, and field projects. (Fall)

Second Group

101 Bioacoustics (3) Brewer

Acoustic analysis of speech and the physiology of reception and processing of speech by the human auditory system. Prerequisite: BiSc 3–4 or 11–12 or equivalent; Psyc 1 or 5 or 6 or equivalent. (Fall)

103 Biophonetics (3) Linebaugh

Biological bases of speech production. Emphasis on the function

of the nervous system, the respiratory system, and the vocal and articulatory mechanisms in the production of intelligible speech. Prerequisite: BiSc 3–4 or 11–12 or equivalent; Psyc 1 or 5 or 6 or equivalent. (Fall)

104 **Introduction to Speech Pathology** (3) Regnell

Survey of the field of speech pathology. The effect of body-system pathologies and environmental factors on the production of speech and language. Prerequisite: SpDr 103. (Spring)

*105–6 **The Writing of Plays** (3–3) Claeyssens

Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. To apply for instructor's consent a student should, before registration, submit a writing sample.

108 **Introduction to Audiology** (3) Brewer

(Formerly SpDr 106)

Survey of the field of audiology. The effect of body-system pathologies on the reception of speech and other acoustic stimuli. Procedures of pure-tone and speech audiometry. Clinical and educational services for the hearing impaired. Prerequisite: SpDr 101. (Spring)

111 **Business and Professional Speaking** (3) Staff

Study of the communication process in business and professional speaking; practice in presenting technical reports; selling policies, programs, and services; interviews; conferences; speech in training and supervisory activities. Primarily for nonmajors. (Fall)

112 **Persuasion** (3) Keller

In-depth study of the principles and techniques of persuasive speaking, with emphasis on the psychological factors in audience analysis and adaptation. Prerequisite: SpDr 1 or permission of instructor. Recording fee, $4. (Spring)

114 **Introduction to Acting** (3) Staff

For non-dramatic art majors. Introduction to the principles of acting for stage and television. Practice in scene work and on-camera performance. (Summer)

115 **Acting I** (3) Garner

Basic techniques of concentration, imagination, and character analysis. Concurrent registration in HKLS 115 required. Prerequisite: SpDr 11, 32. (Fall)

116 **Acting II** (3) Garner

Principles of role development. Scene study, principally in 20th century realism. Concurrent registration in HKLS 116 required. Admission by audition. Prerequisite: SpDr 115. (Spring)

118 **Structural Analysis of Speech and Language** (3) Staff

Development of skills in the phonetic/phonemic transcription and syntactic analysis of oral language samples. Prerequisite: Psyc 115 or equivalent. (Spring)

119 **Clinical Procedures for Communication Disorders** (3) Hillis

Development of skill in precision treatment techniques for com-

*Interdepartmental course offered by the Speech and Drama and English Departments.

munication disorders. Emphasis on accountability of providers of clinical and educational services for the communicatively handicapped. Prerequisite: Psyc. 121 and 131, or equivalent; senior standing or permission of instructor. (Fall)

121 **Group Discussion and Conference Leadership** (3) Staff

Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prerequisite: SpDr 1 or permission of instructor. (Fall and spring)

126 **Argumentation and Debate** (3) Reynolds

Study of the advocacy system: special emphasis on issue identification, use of evidence, and logical proof. Extensive practice in argumentative speaking. Recording fee, $4. Prerequisite: SpDr 1 or permission of instructor. (Spring)

127–28 **Advanced Debate Practice** (1–1) Keller

Admission by permission of instructor, after one semester of satisfactory participation in intercollegiate debate program. May be repeated for a total of four semester hours of credit. (Fall and spring)

133 **Broadcasting in America** (3) Staff

Study of the origins, structure, and nature of American broadcasting with emphasis on communicative factors and effects of television programming. (Fall)

134 **Radio Production and Performance** (3) Staff

Introduction to the basic concepts of radio as a communicative medium; emphasis on the design and production of a variety of radio programs. Prerequisite: SpDr 133 or permission of instructor. Recording fee, $5. (Spring)

135–36 **Radio Workshop** (1–1) Staff

Practical work in campus radio station. Admission by permission of instructor, after one semester of satisfactory participation in WKCR activities. May be repeated for a total of four semester hours of credit. (Academic year)

141 **Negotiations and Conflict Resolution** (3) Keller

Speech communication factors involved in negotiation of conflict. Use of models and simulations. (Summer)

143 **Origins of Contemporary Rhetorical Theory** (3) Reynolds

Study of rhetorical theory and method as they evolved in the Western world from the classical period to the present. (Fall, even years)

144 **History and Criticism of American Public Address** (3) Reynolds

Study of American oratory from its pre-Revolution origins to the present day, interpreted in terms of issues and movements. (Sprin, odd years)

145 **Television Production and Performance** (3) Staff

Basic course in television production techniques and skills. Programming, directing, script-writing, and other aspects of television

production. Extensive practice in working television equipment; emphasis on various in-studio projects. Recording fee, $5. Prerequisite: SpDr 133 and permission of instructor. (Fall)

146 **Advanced Television Production and Performance** (3) Staff

Advanced study and practice of television production techniques. Students are expected to demonstrate skill in working with studio equipment and in the development of television programs from original concepts to final productions. Recording fee, $5. Prerequisite: SpDr 145 and permission of instructor. (Spring)

147 **Innovations in Television Communication** (3) Staff

Utilization of television technology for non-broadcast purposes (i.e., medical, legal, therapeutic, artistic, and educational). (Summer)

148 **Innovations in Television Production** (3) Staff

Advanced production work in areas described in SpDr 147. Prerequisite: SpDr 145, 147, and permission of instructor. (Summer)

149 **Communicative Effects of Broadcast Programming** (3) Staff

Theories and research pertaining to issues, controversies, and problems of cultural conditioning in American broadcast programming. Includes effects of violence on television, childrens' programming, bias in the news, political imagery. (Summer)

151 **Stagecraft** (3) Sabelli

Lecture (2 hours), laboratory (1 hour). Theories and practicum in construction, rigging, and scene painting. (Fall and spring)

152 **Advanced Stagecraft** (3) Sabelli

(Formerly Stagecraft)

Lecture (2 hours), laboratory (1 hour). Theories and practicum in the fundamentals of lighting and sound for the theater and television. (Spring)

154 **Directing** (3) Garner

Fundamentals of script analysis, casting and rehearsal techniques. Prerequisite: SpDr 115 and 151. Laboratory fee, $5. (Fall)

155–56 **Play Production Practice** (1–1) Sabelli

Formalized classes in makeup design, properties design, stage management, and scene painting, or laboratory assignments in costuming, scenery, public relations, lighting and sound, acting, or oral interpretation. May be repeated for a total of four semester hours of credit, but a different area must be elected at each registration. (Academic year)

161–62 **Theatrical Styles** (3–3) Staff

Detailed study of the culture, climate, and production techniques of significant periods of drama. Prerequisite: SpDr 165–66. (Academic year)

163 **Musical Theater** (3) Parady, Sabelli

Growth of American musical theater. Development of all its components: libretto, dance, composition, lyrics, and the overall fabric of production. (Summer)

165–66 **History of the Theater** (3–3) Parady

An examination of the development and growth of the theater from its beginnings to the present. SpDr 165: Greek through Restoration. SpDr 166: the 18th century to the present. (Academic year)

169 **Introduction to Creative Dramatics** (3) Staff

Study of philosophies and practices underlying dramatics with children; materials and methods for conducting improvised dramatic activities in elementary and secondary education. (Spring)

*192 **The American Cinema** (3) Mergen

History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture.

193 **Scene Design** (3) Sabelli

Fundamental study of scenography, including drafting, rendering and model construction. (Fall)

195 **Costume History and Construction** (3) Staff

(Formerly Costuming)

History of fashion in Western civilization from ancient Egypt to the present. Laboratory work in costume construction. (Fall)

196 **Independent Study** (1 to 6) Staff

Independent research and special projects. Open only to undergraduate students in their senior year. Before students are permitted to register for SpDr 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman.

Third Group

SpDr courses numbered from 268 through 290 and SpDr 295 are for Master of Arts candidates in the field of speech pathology and audiology; other students may be admitted by permission of the department.

215–16 **Acting: Scene Study** (3–3) Staff

Scene work in classic and other nonrealistic drama. Admission by audition. Both courses may be repeated once for credit. Recording fee, $4. (Academic year)

251 **Advanced Scene Design** (3) Sabelli

Exploration of all styles of traditional and contemporary scenography. Creative projects include rendering, model construction, costume design, lighting design, and properties design. Admission by permission of instructor. (Spring, odd years)

252 **Advanced Costuming** (3) Staff (Spring)

Study of special design, style, and construction problems.

255 **Lighting Design** (3) Sabelli

Theory and execution of lighting design. Prerequisite: SpDr 15[illegible] (Spring, even years)

* Joint offering of the Department of Speech and Drama and the American Studies Program. Students may register under either designation.

256 **Directing Seminar** (3) Garner
(Formerly Advanced Directing)
Problems in directing plays from selected periods under a variety of production circumstances. May be repeated for credit. (Fall)

257 **Modern Trends** (3) Staff
Study of recent developments in dramatic theory, literature, and production. (Fall, even years)

258 **Theater Management** (3) Staff
Theory and practice in theater management, promotion, box office, and house management. Admission by permission of instructor. (Fall, odd years)

*267 **Interdisciplinary Study of Language Disorders** (3)
For graduate students in education, speech and hearing and psychology. Psycho-educational team participation, team diagnosis and analysis of case studies. Multidisciplinary understanding of philosophies of learning and treatment of symbolic malfunctioning. (Fall)

268 **Clinical Practice in Communication Disorders** (1–3) Staff
Supervised clinical practice in the evaluation and treatment of communication disorders. May be repeated for a total of three semester hours of credit. (Fall and spring)

269 **Community Programs in Communication Disorders** (3) Herer
Methods and procedure for the planning, management, and operation of hospital, school, and other community programs for the communicatively handicapped. (Spring)

271 **Evaluation of Speech Articulation Disorders** (2) Regnell
Evaluation of persons with speech articulation disorders: staffing of clinical cases, test demonstrations, critical evaluations of speech articulation testing procedures. Laboratory fee, $5. (Fall)

272 **Etiology of Speech Articulation Disorders** (2) Hillis
Biological, linguistic, and psychological bases for disorders of speech articulation; staffing of clinical cases. Laboratory fee, $5. (Spring)

273 **Treatment of Speech Articulation Disorders** (2) Regnell
Treatment procedures of persons with disorders of speech articulation; emphasis on programmed and other objective procedures for the improvement of speech articulation; staffing of clinical cases. Laboratory fee, $5.

274 **Evaluation of Fluency Disorders** (2) Hillis
(Formerly Treatment of Fluency Disorders in Adults)
Theories of the etiology of stuttering and related disorders; procedures for evaluating fluency disorders. Laboratory fee, $5. (Fall)

275 **Treatment of Fluency Disorders** (2) Hillis
(Formerly The Nature of Fluency Disorders)
Treatment procedures for disorders of speech fluency. Laboratory fee, $5. (Spring)

* An interdisciplinary course offered by the Departments of Education, Psychology, and Speech and Drama.

276 **Fluency Disorders in Children** (2) Hillis
(Formerly Treatment of Fluency Disorders in Children)
Developmental aspects of stuttering; evaluation and treatment of fluency disorders in children. Laboratory fee, $5.

277 **Clinical Evaluation of Language Disorders** (3) Staff
Evaluation of language disorders in children and adults; class staffings of language pathology cases, test demonstrations, and critical evaluations of formal and informal language testing procedures. Laboratory fee, $7.50. (Fall)

278 **Applied Research in Language Disorders** (3) Linebaugh
Current neurolinguistic and psycholinguistic research related to language pathologies in children and adults; emphasis on the treatment of aphasia in adults including demonstrations of objective procedures for charting clinical progress. Laboratory fee, $7.50. (Spring)

279 **Clinical Treatment of Language Disorders in Children** (3) Linebaugh
Current language therapy programs for children and critical evaluation of these programs in light of modern psycholinguistic concepts; emphasis on objective procedures for attaining or modifying goals in language therapy for children with various handicapping conditions. Laboratory fee, $7.50. (Summer)

280 **Functional Voice Disorders** (2) Regnell
Review of the normal structure and function of the vocal mechanism; acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for persons with functional voice disorders. Laboratory fee, $5. (Fall)

281 **Alaryngeal Speech** (2) Regnell
Acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for laryngectomized persons. Laboratory fee, $5. (Spring)

282 **Organic Voice Disorders** (2) Regnell
Acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for persons with organic voice disorders; special consideration given to the management of voice disorders in children. Laboratory fee, $5. (Spring)

283 **Aural Rehabilitation** (3) Brewer
Systems, principles, and methods of auditory training and speech reading, including development of lesson plans and their application in resolving communication problems of acoustically-handicapped individuals. Laboratory fee, $7.50. (Fall)

284 **Advanced Clinical Audiology** (3) Bowling
Principles and methods underlying assessment of auditory disorders; emphasis on bone conduction, masking, and speech intelligibility. Clinical implications, tests; demonstration and practicum. Laboratory fee, $7.50. (Fall)

285 **Hearing Aids** (3) Brewer
Discussion of hearing-aid characteristics and electroacoustic measurements; hearing-aid effectiveness in improving communicative ef-

ciency; procedures for selection and clinical evaluation of hearing aids; counseling of the patient. (Spring)

286 **Special Auditory Tests** (3) **Bowling**

Special speech and pure tone audiometric techniques for differentiating conductive, cochlear, and retro-cochlear lesions, for identifying functional hearing losses. Clinical application of tests and interpretation of results. Laboratory fee, $7.50. (Fall)

287 **Auditory Processing** (3) **Bowling**

(Formerly Auditory Perception and Comprehension)

Detailed study of the factors which affect auditory perception and comprehension; methods and procedures used in identifying disorders of auditory perception and comprehension. Laboratory fee, $7.50. (Spring and summer)

288 **Psychosocial Aspects of Hearing Loss** (3) Bowling

Consideration of the rationale and procedures for evaluating the social and emotional behavior as well as the intellectual potential of those with impaired hearing. Laboratory fee, $7.50. (Spring)

289 **Pediatric and Impedance Audiometry** (3) Staff

(Formerly Pediatric Audiology)

Development of skills in impedance audiometry and in audiological assessment of young children and other difficult-to-test groups. Laboratory fee, $7.50. (Fall)

290 **Management of the Hearing-impaired Child** (3) Brewer

Overall management approach to the hard-of-hearing child including diagnosis, parent counseling, amplification, educational placement, treatment programs and procedures, and re-evaluation. Emphasis on aural habilitation within an educational framework. (Summer)

292 **Language Intervention in the Schools** (3) Staff

Analysis of language performance problems of school children and development of intervention strategies. For special education teachers, learning disabilities specialists, remedial reading specialists, audiologists, speech pathologists, and teachers of the hearing-impaired. Professional experience in one of these fields is recommended, but not required. (Summer)

294 **Independent Research in Dramatic Art** (arr.) Staff

May be repeated for credit. (Fall and spring)

295 **Independent Research in Speech and Hearing** (arr.) Staff

299–300 **Thesis Research** (3–3) **Staff**

(Fall and spring)

STATISTICS

Professors H.F. Bright, S. Kullback *(Emeritus)*, H.W. Lilliefors, A.D. Kirsch, R.H. Shumway, J. Cornfield, J.L. Gastwirth, L. Shaw *(Research)*, N. Mantel *(Research)*, D. Krueger *(Research)*, S.W. Greenhouse *(Chairman)*

Professorial Lecturers F.C. Leone, J. Bailar III

Associate Professors C.T. Ireland, R.E. Thomas

Associate Professorial Lecturers M.A. Schwartz, J.H. Ware, K.M. Wolter

Assistant Professors J.P. Dirkse III, J.M. Lachin III *(Research)*
Adjunct Assistant Professor J.K. Kern
Assistant Professorial Lecturers W. Rutiser, T.C. Teeples
Lecturer J. Aigner

Bachelor of Arts or *Bachelor of Science with a major in Applied Statist*
(Departmental) or *Mathematical Statistics (Departmental)* or *Statistics with*
option in Computer Science (Departmental) The following requirements mu
be fulfilled:

1. The general requirements as stated on pages 73–74, 80–86. (Students should
consult the departmental advisor regarding courses to be taken in satisfying
the requirements for meaningful initiation into the humanities and soci
studies.)

2. Prerequisite courses for all three majors—Math 31, 32; Stat 91.

3 (a) Required course for the applied statistics major—Math 124. (Courses
in computer science and some field of application are recommended. Foreig
language is not required for this major.)

(b) Required courses in related areas for the mathematical statistics major
—Math 124, 139, 140, 157; two years of introductory French, German or Ru
sian, or equivalent. (Courses in computer science, mathematics, and some fie
of application are recommended.)

(c) Required courses for the statistics major with an option in computer
science—Math 33, 113, 124, 153. (Foreign language is not required for th
major.)

4. (a) Required courses in the applied statistics major—Stat 106, 110, 117, 118,
157-58, 189, plus three approved second-group courses in statistics.

(b) Required courses in the mathematical statistics major—Stat 106, 11
118, 157-58, 189–90; plus three approved second-group courses in statistics

(c) Required courses in the statistics major with an option in computer
science—Stat 106, 110, 114 (in that order), 117, 118, 157-58, 189; plus two ap
proved electives in mathematics and statistics (Math 101, 270 and Stat 198 ar
recommended).

To assure a balanced program, departmental approval of electives is require
for both majors.

Master of Science in the field of Applied Statistics or *Master of Arts in the*
field of Mathematical Statistics—The program of study consists of 30 semest
hours of course work without a thesis. In exceptional cases the department ma
approve a program of study consisting of 24 semester hours of course wor
plus a thesis, equivalent to six additional semester hours. Candidates must pas
a written Master's Comprehensive Examination and must fulfill the tool re
quirement by passing either a reading knowledge examination in an acceptab
foreign language or an examination in computer language. The successful com
pletion of course work in computer programming does not obviate the require
ment to pass a special examination should the computer option be elected as
tool. For prerequisites and additional requirements, see below.

Master of Science in the field of Applied Statistics—Prerequisite: a bachelor's
degree with a major in applied statistics from this University, or an equivalen
degree. If undergraduate study did not include equivalent required courses a
this University, those courses must be taken as prerequisite to graduate study

Required: the general requirements, pages 89–97, including a minimum of 2
semester hours of statistics. Courses are selected in consultation with th
advisor.

Master of Arts in the field of Mathematical Statistics—Prerequisite: a bache
lor's degree with a major in mathematical statistics from this University, or an
equivalent degree. If undergraduate study did not include equivalent courses a
this University, those courses must be taken as prerequisite to graduate study

Required: the general requirements, pages 89–97, including Stat 201–2 and 217–18. The remaining 18 semester hours must be selected in consultation with the advisor.

Doctor of Philosophy in the field of Mathematical Statistics—Prerequisite: the degree of Master of Arts in the field of mathematical statistics from this University, or an equivalent degree.

Required: the general requirements, pages 89–91, 97–99. A minimum of 24 semester hours of course work must be taken in residence at this University before the General Examination may be completed. The General Examination consists of two written parts followed by an oral examination. Part I covers mathematics and probability and may be taken after successful completion of Stat 259–60 or 273–74. Part II may be taken after the successful completion of the remaining core courses (Stat 201–2, 217–18, 257, 263–64, 265–66, 287) and electives selected in consultation with the advisor. The tool requirement may be fulfilled by passing a reading knowledge examination in one foreign language and an examination in computer language. The successful completion of course work in computer programming does not obviate the requirement to pass a special examination should the computer option be elected as a tool.

Research Fields: Bayesian inference, biostatistics, design of experiments, information theory, multivariate analysis, nonparametric statistics, probability, robust methods, sampling, statistical inference, stochastic processes, and time series analysis.

Departmental prerequisite: One entrance unit in algebra is prerequisite to all first-group courses in statistics.

First Group

***51 Introduction to Business and Economic Statistics** (3) — Bright, Kern

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation, times series, index numbers. **Laboratory fee, $18.** **(Fall and spring)**

***53 Introduction to Statistics in Social Science** (3) — Staff

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. Laboratory fee, $18. (Fall and spring)

***91 Principles of Statistical Methods** (3) — Lilliefors

Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. **Laboratory fee, $18.** **(Fall and spring)**

97 Introduction to Computer Programming (3) — Staff

Lecture (2 hours), laboratory (2 hours). Computer and programming concepts. High-level language programs written by students will be run on the University computer. Laboratory fee, $25. (Fall and spring)

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* Stat 51, 53 and 91 are related in their subject matter, and credit hours for only one of the three may be applied toward a degree.

Second Group

103 Statistics in Business (3) — Staff

Advanced study of statistical techniques in business. Prerequisite: Stat 51 or equivalent. Laboratory fee, $18. (Spring)

105 Statistics in the Behavioral Sciences (3) — Kirsch

(Formerly Statistics in the Behavioral Sciences and Education)

Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53 or equivalent and satisfactory performance on a placement examination. Laboratory fee, $18. (Fall and spring)

106 Introduction to Computing (3) — Thomas

Development of basic computing ideas using a high-level language. Emphasis on careful design and implementation of programs using "structured programming." Prerequisite or concurrent registration: Math 31, or permission of the instructor. Laboratory fee, $25. (Fall)

110 Computer Programming (3) — Thomas and Staff

Lecture (2 hours), laboratory (2 hours). Computer concepts beyond the introductory level: an introduction to assembly language and advanced high-level language programming. Prerequisite: Stat 106. Laboratory fee, $25. (Spring)

111 Business and Economic Statistics I (3) — Gastwirth, Thomas

Statistical methods used in economics and business. (Fall and summer)

112 Business and Economic Statistics II (3) — Staff

Case work to illustrate quantitative procedures for solution of economic and business problems. Prerequisite: Stat 111 or equivalent. (Spring and summer)

114 Data Structures (3) — Staff

Files and file systems. Basic structure of processing operations, creation updating, sorting, merging, searching, linkage, hashing. Introduction to data processing, storage, and retrieval. Emphasis on computer techniques. Prerequisite: Stat 110. Laboratory fee, $25. (Fall)

117 Analysis of Variance (3) — Ireland

Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance: random block, factorial, Latin square, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee, $18. (Spring and summer)

118 Regression Analysis (3) — Staff

Lecture (3 hours), laboratory (1 hour). Regression and correlation theory: simple, partial, and multiple. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 107. Laboratory fee, $18. (Fall, spring and summer)

119 Bases of Statistical Decision-making (arr.) — Kerr

For students in the Navy Graduate Financial Management Program only. Introduction to techniques of decision-making; emphasis on applications rather than theory.

*123 **Introduction to Econometrics** (3) Staff

Construction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Econ 101, 102; Math 31 or 51; Stat 111. (Spring)

127 **Statistics for the Biological Sciences** (3) Greenhouse

Introduction to statistical techniques and reasoning applicable to the biomedical and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design. (Fall and spring)

131 **Contingency Table Techniques** (3) Staff

Analysis of multidimensional contingency tables, including estimation, tests of hypotheses, and log-linear regression. Prerequisite: Stat 118 or permission of instructor. Laboratory fee, $18. (Spring)

153–54 **Mathematical Models in Population Genetics** (3–3) Staff

Basic elements of genetics and cell reproduction, deterministic models of gene frequency: the Hardy-Weinberg law; effects of mutation, migration, and selection on gene frequency; multiple loci and multiple allele models; inbreeding; Fisher's fundamental theorem of natural selection; stochastic models of changes in gene frequency, including methods of direct product branching processes and diffusion equation methods. (Academic year)

155 **Introduction to Probability** (3) Shumway

Probability distribution, Bayes' theorem and postulate, mathematical expectation, laws of large numbers. Prerequisite: one entrance unit in algebra.

157–58 **Introduction to Mathematical Statistics** (3–3) Dirkse

Distribution theory, sampling theory, estimation, hypothesis testing, regression analysis, experimental design. Prerequisite: differential and integral calculus. (Academic year)

159 **Principles of Bayesian Statistics** (3) Staff

Lecture (3 hours), laboratory (1 hour). Probability as a measure of uncertainty of knowledge; concepts and techniques of Bayesian inference. Prerequisite: three semester hours in introductory statistics, or equivalent. Laboratory fee, $13.

161–62 **Information Theory** (3–3) Staff

Elementary development of information theory and applications to communication, coding, psychology, linguistics, etc. Prerequisite: three semester hours selected from Stat 155, 157, 159, 189. Laboratory fee, $18.

165–66 **Multivariate Techniques** (3–3) Shumway

Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical, and physical sciences. Prerequisite: Stat 117, 157–58 Laboratory fee, $18. (Academic year)

181 **Applied Time Series Analysis** (3) Shumway

Application of time series analysis to data from economics, medicine,

* An interdepartmental course offered by the Departments of Statistics and Economics.

and the physical sciences. Fourier methods in regression and analysis of variance, autoregressive and moving average models, signal discrimination and detection. Prerequisite: Stat 117, 118. Laboratory fee, $30. (Spring)

183 **Intermediate Statistical Laboratory** (3) Staff

Applications to advanced experimental design and other topics. Admission by permission of instructor. Laboratory fee, $25. (Fall or spring)

187 **Theory of Sampling** (3) Kirsch

Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall and summer)

188 **Nonparametric Statistical Inference** (3) Lilliefors

Statistical inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 91 or equivalent. (Spring)

189–90 **Mathematical Probability and Applications** (3–3) Bailar

Combinatorial analysis, conditional probability, stochastic independence, probability distributions, random variables, laws of large numbers. Prerequisite: differential and integral calculus. (Academic year)

191 **Probabilistic and Statistical Methods for Operations Research** (3) Leone

Primarily for students in the School of Engineering and Applied Science. Axiomatic theory, random variables, Bayes' theorem, some special distributions, generating functions, convergence, Poisson and Markov processes. Prerequisite: ApSc 115 or equivalent. (Fall and spring)

193 **Survey Design** (3) Kirsch

Applications of survey methodology, including questionnaire design and wording, field methods, interviewer and nonresponse biases, and quality-control procedures. Problems in sample frame development. Prerequisite: Stat 187 or equivalent, and permission of instructor. (Spring)

195 **Reading and Research in Statistics** (arr.) Staff

May be repeated once for credit. (Fall and spring)

197 **Digital Computer Programming with Applications** (3) Thomas

Lecture (2 hours), laboratory (2 hours). Use of digital computer in statistical and other computational work. Writing, debugging, and running programs on the digital computer in the University Computer Center. Prerequisite: Stat 117; or Math 32; or permission of instructor. Laboratory fee, $25. (Spring)

198 **Current Topics in Computer Programming** (3) Rutiser

Concepts of programming, programming languages, operating systems, nonnumeric programming compiler techniques. Prerequisite: Stat 114 or permission of instructor. Laboratory fee, $25. May be repeated for credit. (Spring)

Third Group

201–2 **Mathematical Statistics** (3–3) Ireland

Distribution theory, sampling theory, estimation, sufficient statistics, hypothesis testing, analysis of variance, multivariate normal distribution. Prerequisite: advanced calculus. (Academic year)

205 **Data Analysis for Policy Decisions** (3) Kirsch

(Formerly Data Analysis for Educational Policy Decisions)

The framing of questions of importance in policy and the use of existing data bases to answer these questions. Laboratory fee, $20. Prerequisite: Stat 105 or equivalent. (Summer)

206 **Factor Analysis** (3) Kirsch

Concepts of factor analysis and their utility in various phases of research and related topics, including cluster analysis. Prerequisite: Stat 105 or equivalent and permission of instructor. Laboratory fee, $18.

217–18 **Advanced ANOVA and Experimental Design** (3–3) Ireland

Advanced theory and application of general linear hypothesis to experimental designs. Prerequisite: Stat 157–58 or 201–2; Math 124. (Academic year)

221 **Design of Experiments for Behavioral Sciences and Education** (3) Kirsch

Applications of advanced experimental design to research problems in behavioral sciences and education. Prerequisite: Stat 105 or 118 or equivalent and permission of instructor. Not open to graduate students in Statistics. (Spring)

223–24 **Bayesian Inference** (3–3) Cornfield

Systematic development of Bayesian viewpoint, with applications to the classical problems of statistics. Prerequisite: Stat 201–2.

225–26 **Introduction to Biostatistics** (3–3) Cornfield

Probability models, inference, and study design as applied to biomedical investigations. Prerequisite: Stat 201–2. (Not offered academic year 1977–78.)

231 **Contingency Table Analysis** (3) Staff

A study of the theoretical bases underlying the analysis of categorial data. Prerequisite: Stat 201–2 or 257–58. (Fall)

242 **Advanced Statistical Problems in Economic Analysis** (3) Gastwirth

Applications of advanced theory to economic data. (Spring)

257–58 **Distribution Theory** (3–3) Gastwirth

Properties of distribution and characteristic functions, probability bounds, large- and small-sample theory, order statistics. Prerequisite: Stat 157–58 or 201–2. (Academic year)

259–60 **Advanced Mathematical Probability** (3–3) Dirkse

Measure theory, probability spaces, random variables, probability distributions, sequences and sums of random variables, conditioning, limit theorems, martingales. Prerequisite: Math 224 or equivalent.

261 Sequential Design and Analysis (3) — Staff

Wald's theory of sequential designs, optional stopping, choice of sequential experiments. Prerequisite: Stat 201-2. (Not offered academic year 1977–78.)

262 Nonparametric Inference (3) — Lilliefors

Inference when the form of the underlying distribution is unspecified. (Fall)

263–64 Topics in Statistical Inference (3–3) — Lilliefors

Estimation, testing of statistical hypotheses, tests of significance, likelihood ratio, Bayesian inference and the use of prior knowledge, decision theory. Prerequisite: Stat 201-2 or 257–58. (Not offered academic year 1977–78.)

265–66 Multivariate Analysis (3–3) — Greenhouse

Tests of significance, homogeneity, independence, canonical and vector correlations, multivariate normal distribution, generalized Student's ratio, multivariate linear hypothesis, and analysis of variance. Prerequisite: Stat 201-2 or 257-58, Math 124. (Academic year)

269 Statistical Decision Theory (3) — Ware

Wald's theory of decision functions. Sequential analysis. Multi-decision problems. Existence theorems, complete class theorems, and other general decision theoretic results. Prerequisite: Stat 189–90; and 201–2 or 257–58. (Not offered academic year 1977–78)

273–74 Stochastic Processes (3–3) — Staff

Fundamental notions of Markov chains and processes, generating functions, recurrence, limit theorems, random walks, Poisson processes, birth and death processes, applications. Prerequisite: Stat 189-90; and 201-2 or 257-58. (Academic year)

***275 Econometrics I: Introduction (3)** — Staff

Single equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equations problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Recommended: a course in matrix theory. (Fall)

***276 Econometrics II: Simultaneous Equations Models (3)** — Staff

Economic models and simultaneous equations systems. Prerequisite: Stat 275. (Spring)

***279 Methods in Economic Statistics (3)** — Gastwirth

Statistical methods, such as regression, analysis of variance and chi-square, used to analyze economic data. Prerequisite: six semester hours in statistics. (Fall and spring)

281 Time Series Analysis I: Foundations (3) — Shumway

(Formerly Time Series Analysis)

Basic structure of stationary time series. Differentiation, integration, spectral representations, linear filtering, mean square estimation, the Finite Fourier Transform, laws of large numbers, autoregressive moving average processes. Prerequisite: Stat 201–2 and 259–60 or 273–74. (Not offered academic year 1977–78.)

* An interdepartmental course offered by the Departments of Statistics and Economics

282 **Time Series Analysis II: Statistical Inference** (3) Shumway

Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination filtering, spectral analysis of variance. Prerequisite: Stat 281. (Not offered academic year 1977–78.)

283 **Advanced Statistical Laboratory** (3) Staff

Application of the University computer to complex statistical problems on an individual study basis. Admission by permission of instructor. Laboratory fee, $25. May be repeated for credit only with permission of the Department. (Fall and spring)

285–86 **Seminar** (3–3) Staff

Admission by permission of instructor. (Stat 285—fall, sping, and sumer; Stat 286—fall and spring)

287–88 **Modern Theory of Sample Surveys** (3–3) Wolter

Application of statistical theory to the sampling of finite populations. Simple, stratified, cluster, double and subsampling. Special topics, including super-populations and randomized response. Prerequisite: Stat 91 and Math 32 or equivalent. (Academic year)

289 **Seminar: Current Topics in Biostatistics** (3) Staff

Discussion of selected current literature in clinical trials, epidemiology, automated diagnosis, and other topics of biomedical interest. Admission by permission of instructor. (Not offered academic year 1977–78.)

295 **Reading and Research** (3) Staff

May be repeated once for credit. (Fall or spring)

297 **Problems in Mathematical Statistics** (3) Staff

298 **Seminar: Special Topics** (3) Staff

(Formerly Seminar: Combinatorial Probability)

Topic for summer 1977: Statistical reasoning in legal cases.

299–300 **Thesis Research** (3–3) Staff

(Fall, spring, and summer)

Fourth Group

*378 **Seminar: Topics in Econometrics** (3) Staff

Limited to graduate students, primarily for doctoral students; offered as demand requires. A research seminar covering current econometric literature and special topics. Admission by permission of instructor.

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall, spring, and summer)

* An interdepartmental course offered by the Departments of Statistics and Economics.

URBAN AND REGIONAL PLANNING

Professors D.C. McGrath, Jr. *(Chairman)*, F. Belaunde-Terry *(Visiting)*
Adjunct Professor F. Gutheim
Professorial Lecturers N. Beckman, S.J. Bellomo
Associate Professors S. Greene, S.S. Fuller
Associate Professorial Lecturers S.D. MacDonald, R.M. Winick
Assistant Professor D. Gale

A program leading to the degree of Master of Urban and Regional Planning which provides preparation for professional practice in the planning field, and areas of specialization in planning as components of programs leading to the degrees of Master of Arts in Government, Master of Public Administration, Doctor of Business Administration, and Doctor of Public Administration, are offered by the School of Government and Business Administration (see pages 127–59).

Second Group

153 **Principles of Urban Planning and Design** (3) Greene

Studio course for undergraduates. Basic elements of urban planning and design applied to community problems. Survey of planner's role in developing and implementing creative solutions to urban problems. (Fall)

Third Group

201 **Introduction to Urban and Regional Planning** (3) McGrath

Introduction to history, concepts, and activities of urban and regional planning. Discussion of trends in urbanism and the influences of technology and social change. (Fall, spring, and summer)

202 **Urban Planning Theory** (3) Gale

Development of the fundamental theories and concepts of urban growth and change, theories of the planning process, the role of politics in the planning process, and roles of the planner. Prerequisite: U&RP 201 or permission of instructor. (Fall and spring)

203 **Fundamentals of Urban Design** (4) Greene

Planning and design studio to develop and apply planning methods and graphic techniques, principles of land use and urban design; analysis of factors affecting community development and change. Open only to candidates for the degree of Master of Urban and Regional Planning. Laboratory fee, $15. Prerequisite: U&RP 201 or permission of instructor. (Spring)

204 **Urban Development Planning** (3) Greene

Planning and design studio: investigation of social, environmental, and technological factors in planning. Application of comprehensive planning process to typical problems of community growth and development. Laboratory fee, $15. Prerequisite: U&RP 203 or permission of instructor. (Fall)

205 **Urban Housing** (3) Fuller

Examination of the building industry, housing market characteristics, analytical techniques, national needs, costs, financing, federal pro-

grams, technology, rehabilitation, and policy formulation. Prerequisite: U&RP 201. (Spring)

206 **Community Facilities Planning** (3) Fuller

Planning implications of essential public facilities which comprise community infrastructure. Emphasis on developing an understanding of the special design, service, and locational requirements of each class of community facility, the relationships among facilities and their effects on urban development and the community at large. Prerequisite: U&RP 201 or permission of instructor. (Spring)

207 **Land Development Planning** (3) McGrath

Selected problems in urban and regional planning: applications of zoning, urban renewal and special programs available for the implementation of development plans. Prerequisite: U&RP 201 or permission of instructor. (Fall)

208 **Urban Transportation Planning** (3) Winick

Relationships between land use and the movement of goods and people in urban areas. Transportation planning principles, policy problems, methods for analyzing demand and systems for urban travel; roles of public agencies and private interests in the planning and development of various modes. Prerequisite: U&RP 201. (Spring)

209 **Urban Transportation Models** (3) Bellomo

Consideration of land use activity, trip generation and distribution, environmental impact, modal choice models, traffic assignment, and decision-making techniques. Review of detail studies, calibration, interactions, applications, and accuracy limitations of various mathematical models. Prerequisite: U&RP 208 or permission of instructor. (Fall)

210 **Urban Development Economics** (3) MacDonald

Economic forces affecting urban growth and change; relationships among cities, metropolitan areas, and regions in the context of the national economy; socioeconomic implications of urban land development policies; basic studies and methods of economic analysis. Prerequisite: Econ 217–18 or equivalent; U&RP 201. (Spring)

212 **Methods of Urban and Regional Analysis** (3) Fuller

Introduction to methods used to analyze, estimate, and forecast population, employment, income and economic growth and development. Includes time series, index numbers, sampling, regression, shift-share, and input-output. Prerequisite: Stat 51 or equivalent. (Fall)

213 **Social Factors in Urban Planning** (3) Gale

Residential location decisions as they affect land use in metropolitan areas. Middle class, elderly, and minority mobility patterns. Effects of discrimination, dislocation, condominiums, and historic preservation. Prerequisite: U&RP 201 or permission of instructor. (Summer)

215 **Advanced Planning Problems** (4) McGrath and Staff

Investigation of complex problems of the metropolitan region, analysis of findings, formulation of proposals, and presentation of material to faculty and cooperating groups. Multidisciplinary team and indi-

vidual planning projects. Studio course. Laboratory fee, $15. Prerequisite: U&RP 203. (Spring)

218 **Metropolitan and Regional Planning** (3) Fuller

Multidisciplinary study of the methods of regional analysis and process of regional planning; development of projects of regional scale requiring problem analysis, synthesis, and plan formulation. Studio course. Laboratory fee, $15. Prerequisite: U&RP 203 and 212 or permission of instructor. (Fall)

232 **Urban Environment and the Planner** (3) Fuller

Exploration of the relationship between people and their urban environment; emphasis on the role of the urban planner. Theory, research, planning methods, current issues, and laws examined. Prerequisite: U&RP 201 or permission of instructor. (Spring)

240 **Federal and State Urban Policy Development** (3) Beckman

Investigation of contemporary trends in the evolution of federal and state governmental functions and programs affecting urban growth and development policy. Planning functions in the evolving relationships among units of federal, state, and metropolitan agencies. Prerequisite: U&RP 201 or permission of instructor. (Fall)

*277–78 **Historic Preservation** (3–3) Gutheim

The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural and humanistic values affecting preservation activities. (Academic year)

290 **Special Topics in Urban and Regional Planning** (3) Staff

Experimental offering: new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Research Methods** (3) Staff

Directed research and investigation of special problems in community development. May be repeated once for credit. (Fall and spring)

298 **Directed Readings and Research in Urban and Regional Planning** (3) Staff

(Fall or spring or summer)

299 **Thesis Seminar** (3) Fuller

Examination of thesis standards, research philosophy and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff

(Fall, spring, and summer)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

* Joint offering of the History and Urban and Regional Planning Departments and the American Studies Program.

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

WOMEN'S STUDIES—GRADUATE STUDY

Visiting Associate Professor E. Reuben *(Director)*
Associate Professorial Lecturer R.H. Osborn
Adjunct Assistant Professor E. Bloomfield

Committee on Women's Studies

E. Bloomfield, L. Brandt, L.G. DePauw, T.Z. Lavine, R.H. Osborn

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in Special Studies with a concentration in Women's Studies, directed by the Committee on Women's Studies and drawing upon faculty from various departments within the university and resource persons in the community.

Women's studies seeks to examine and integrate the contributions of established academic disciplines to an understanding of the historical and contemporary role and status of women, and to provide a framework for the development of feminist research and analysis. Each student will work closely with an advisor in designing a program to meet individual research interests and professional goals. Prospective candidates should consult with the director of the Women's Studies Program.

Master of Arts in Special Studies with a concentration in Women's Studies — Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements, pages 89–97, and 36 semester hours of coursework, with or without a thesis. At least 21 hours must be taken in arts and sciences departments. WStu 220 and 221 are required for all students; WStu 283 and 295 are required for students who do not elect a thesis; WStu 299–300 are required for those who do elect a thesis. A maximum of 24 hours in women's studies is permitted. The remaining hours must be divided as equally as possible between two other fields. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

Third Group

220 **Perspectives on Women** (3) **Staff**
Research and theory from anthropology, economics, history, literature, philosophy, physiology, psychology, sociology. (Fall)

221 **Research Issues in Women's Studies** (3) **Staff**
Socialization and the educational system, work and the economy, sexuality and the family, health and life cycle issues. Problem identification in these and other areas; introduction to current research. Prerequisite: WStu 220. (Spring)

225 **Feminist Theory** (3) **Douglas**
Theoretical foundations of feminism in the U.S. Theories and proposals for change currently espoused. Although focus is primarily on

feminism of contemporary white America, some third world and European thought will be considered. (Fall and spring)

235 **Counseling and Career Development of Women** (3) Osborn
Multidimensional analysis of factors, theories, problems, and practices in career development and its relationship to counseling women. (Fall)

240 **Women and Public Policy** (3) Murphy
Systematic analysis of public policy formation at the federal, state, and local levels as it relates to the status of women. Strategies for change and impact of the women's movement. Team and individual research projects on executive decision-making, legislation and its implementation, and political party structures. (Fall and spring)

241 **Women and the Law** (3) Bloomfield
Legal status of women. Emphasis on marital status, employment, media, education, health services, crime, and the Constitution. (Fall and spring)

251 **Women, Literature, and the Arts** Reuben
Woman as subject and object. Examination of stereotypes, themes, language, patterns, and symbolism in works by and about women. Particular attention to the woman as artist and the development of feminist criticism. (Spring)

260 **Women in the American Work Force** (3) Diner
Multidisciplinary analysis of women's role in the labor force and historical changes in that role. Societal view of women's work in the home and outside it; interrelationships of women in and out of the work force; women's contributions, traditionally and during national crises; class, race, and ethnic differences. (Fall)

270 **Seminar: Selected Topics** (arr.) Staff

280 **Independent Study** (3) Staff
May be repeated for credit. Arrangements must be made with sponsoring faculty member prior to registration.

283 **Practicum in Women's Studies** (3) Connelly
Study of the changing status of women through supervised assignment to public and private agencies engaged in education, counseling, political action, and research. Placement arrangements should begin the semester prior to registration for this course.

284 **Practicum** (arr.) Staff

295 **Independent Research in Women's Studies** (arr.) Staff
Individual library or field research. Program advisor's approval of a written proposal required.

299–300 **Thesis Research** (3–3) Staff

ZOOLOGY

See **Biological Sciences.**

FACULTY AND STAFF OF INSTRUCTION

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education

School of Government and Business Administration

School of Public and International Affairs

EMERITI

Caroline Lander Adams, *Professor Emeritus of Botany*
B.A. 1925, Illinois College; M.S. 1928, University of Chicago; Ph.D. 1932, University of Wisconsin

Errett Cyril Albritton, *Professor Emeritus of Physiology*
B.A. 1916, University of Missouri; M.D. 1921, Johns Hopkins University

Grover LaMarr Angel, *Professor Emeritus of Education*
B.A. 1929, High Point College; M.A. in Ed. 1946, Ed.D. 1952, George Washington University

Ruth Harriet Atwell, *Professor Emeritus of Physical Education for Women*
Ph.B. 1918, Denison University; M.A. in Ed. 1933, George Washington University

Richard Adrian Barrett, *Professor Emeritus of Business Administration*
B.A. 1930, Amherst College; M.B.A. 1932, Harvard University; D.B.A. 1972, George Washington University

Gretchen Rogers Bolwell, *Professor Emeritus of German*
B.A. 1930, M.A. 1931, George Washington University; Ph.D. 1938, Johns Hopkins University

Robert Whitney Bolwell, *Professor Emeritus of American Literature*
B.A. 1916, Case Western Reserve University; M.A. 1917, Ph.D. 1921, Columbia University; Litt.D. 1957, George Washington University

Paul William Bowman, *Professor Emeritus of Biology*
B.A. 1924, University of Pennsylvania; M.A. 1928, George Washington University; Ph.D. 1930, University of Virginia

John Withrow Brewer, *Professor Emeritus of Political Science and International Law*
B.A. 1926, M.A. 1930, Ph.D. 1932, Princeton University

Arthur Edward Burns, *Professor Emeritus of Economics*
B.A. 1931, M.A. 1934, University of California, Berkeley; Ph.D. 1935, George Washington University

Elizabeth Burtner, *Professor Emeritus of Physical Education*
B.A. 1927, Hood College; M.A. 1935, Columbia University

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1956, Cambridge University, England

Wesley Thomas Carroll, *Professor Emeritus of Education*
B.S. 1933, Iowa State University of Science and Technology; M.A. 1940, Ph.D. 1952, University of Nebraska

Richard Bernard Castell, *Director Emeritus of the Student Health Service*
B.A. 1932, M.D. 1935, George Washington University

James Harold Coberly, *Professor Emeritus of English*
B.A. 1933, M.A. 1938, Ph.D. 1949, George Washington University

Elbridge Colby, *Professor Emeritus of Journalism*
B.A. 1912, M.A. 1913, Ph.D. 1922, Columbia University

Oswald Symister Colclough, *Professor Emeritus of Law; Dean of Faculties Emeritus; Emeritus Director of the Patent, Trademark, and Copyright Research Institute*
B.S. 1920, U.S. Naval Academy; LL.B. 1935, Sc.D. 1961, George Washington University; LL.D. 1946, Muhlenberg College

Charles William Cole, *Professor Emeritus of English*
B.A. 1930, M.A. 1931, Ph.D. 1939, George Washington University

George Frederick Conner, *Associate Professor Emeritus of Business Administration*
B.S. 1929, U.S. Military Academy; M.B.A. 1938, Harvard University

Milton Crane, *Professor Emeritus of English*
B.A. 1937, M.A. 1938, Columbia University; M.A. 1941, Ph.D. 1942, Harvard University

Vincent James DeAngelis, *Professor Emeritus of Physical Education*
B.S. in P.E. 1939, M.A. in Ed. 1948, George Washington University

Alan Thomas Deibert, *Professor Emeritus of Romance Languages*
B.A. 1918, Gettysburg College; M.A. 1922, Harvard University

William Webster Diehl, *Professor Emeritus of Mycology*
B.A. 1914, Miami University; M.S. 1915, Iowa State University of Science and Technology; Ph.D. 1932, Harvard University

James Carlton Dockeray, *Professor Emeritus of Finance*
B.A. 1929, Ohio Wesleyan University; M.A. 1931, Ph.D. 1936, Ohio State University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

Charles Edward Galbreath, *Professor Emeritus of International Economics*
B.A. 1931, Colgate University; M.A. 1932, Ph.D. 1941, Cornell University

Frederick Harrell Gibbs, *Professor Emeritus of Health Care Administration*
B.S. 1958, University of Maryland; M.H.A. 1959, University of Minnesota

Wood Gray, *Professor Emeritus of American History*
B.A. 1927, M.A. 1928, University of Illinois; Ph.D. 1933, University of Chicago

Raymond George Hanken, *Professor Emeritus of Human Kinetics and Leisure Studies*
B.S. in P.E. 1936, M.A. in Ed. 1952, George Washington University

Ira Bowers Hansen, *Professor Emeritus of Zoology*
B.S. 1928, M.A. 1929, Wesleyan University; Ph.D. 1932, University of Chicago

Henry William Herzog, *Vice President and Treasurer Emeritus*
B.S. in C.E. 1930, George Washington University

Thomas Willard Holland, *Professor Emeritus of Labor Economics*
B.A. 1923, University of Michigan; LL.B. 1934, Columbia University; Ph.D. 1939, University of Wisconsin

Thelma Hunt, *Professor Emeritus of Psychology*
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

Herbert Jehle, *Professor Emeritus of Physics*
Dr.Ing. 1933, Institute of Technology, Berlin

Joe Lee Jessup, *Professor Emeritus of Business Administration*
B.S. in B.A. 1936, University of Alabama; M.B.A. 1941, Harvard University; LL.D. 1964 University of Chungang, Korea

Eva Mayne Johnson, *Professor Emeritus of Psychology*
B.A. 1949, M.A. 1951, Ph.D. 1957, George Washington University

Everett Herschel Johnson, *Professor Emeritus of Statistics*
B.A. 1926, DePauw University; M.A. 1929, Lehigh University; Ph.D. 1942, University of Michigan

Francis Edgar Johnston, *Professor Emeritus of Mathematics*
B.A. 1921, George Washington University; M.A. 1923, Ph.D. 1926, University of Illinois

Elmer Louis Kayser, *Professor Emeritus of European History; Dean Emeritus of the Division of University Students; University Historian*
B.A. 1917, M.A. 1918, LL.D. 1948, George Washington University. Ph.D. 1932, Columbia University; L.H.D. 1975, Mount Vernon College

Virginia Randolph Kirkbride, *Professor Emeritus of Educational Psychology*
B.A. 1941, M.A. 1942, University of Nebraska; Ed.D. 1959, George Washington University

Frances Kirkpatrick, *Professor Emeritus of Home Economics*
B.S. 1919, University of Missouri; M.A. 1929, Columbia University

Donald Chenoweth Kline, *Professor Emeritus of Art*
B.Arch. 1927, George Washington University. M.F.A. 1951, Catholic University of America

George Martin Koehl, *Professor Emeritus of Physics*
B.A. 1931, University of North Carolina; M.A. 1933, George Washington University

Wolfgang Herbert Kraus, *Professor Emeritus of Political Science and International Affairs*
Dr.Jur. 1929, University of Frankfurt; S.J.D. 1931, Harvard University

Solomon Kullback, *Professor Emeritus of Statistics*
B.S. 1927, City University of New York, City College; M.A. 1929, Columbia University; Ph.D. 1934, George Washington University

John Francis Latimer, *Professor Emeritus of Classics*
B.A. 1922, Litt. D. 1964, Mississippi College; M.A. 1926, University of Chicago; Ph.D. 1929, Yale University

Helen Bennett Lawrence, *Professor Emeritus of Physical Education for Women*
B.S. in P.E. 1934, M.A. 1938, George Washington University

Chester Elwood Leese, *Professor Emeritus of Physiology*
B.A. 1922, M.A. 1925, Ph.D. 1930, University of Iowa

Wolfram Karl Legner, *Professor Emeritus of German*
B.A. 1923, Harvard University; M.A. 1932, Ph.D. 1936, University of Pennsylvania

Laurence Pereira Leite, *Professor Emeritus of Art*
M.A. 1956, Ph.D. 1966, Johns Hopkins University

Kurt London, *Professor Emeritus of International Affairs*
Ph.D. 1923, University of Würzburg

Eugene Ross Magruder, *Associate Professor Emeritus of Business Administration*
B.B.A. 1950, M.B.A. 1951, University of Texas at Austin; Ph.D. 1959, Ohio State University

John Russell Mason, *Librarian Emeritus; Curator of Art Emeritus*
B.A. 1923, M.A. 1925, George Washington University; M.S. in L.S. 1933, Columbia University

Florence Marie Mears, *Professor Emeritus of Mathematics*
B.A. 1917, Goucher College; M.A. 1924, Ph.D. 1927, Cornell University

Howard Maxwell Merriman, *Professor Emeritus of American Diplomatic History*
B.A. 1930, M.A. 1931, University of Cincinnati; M.A. 1932, Ph.D. 1937, Harvard University

Franz Henry Michael, *Professor Emeritus of International Affairs and Far Eastern History*
Sinological Diploma 1930, University of Berlin; Referendar 1931, Dr.Jur. 1933, University of Freiburg

Edith Elizabeth Mortensen, *Professor Emeritus of Zoology*
B.A. 1925, Carleton College; M.A. 1927, University of Minnesota; Ph.D. 1945, George Washington University

Sam Clark Munson, *Professor Emeritus of Biology*
B.S. 1930, M.S. 1931, Mississippi State University; Ph.D. 1952, University of Maryland

William Henry Myers, *Professor Emeritus of Physical Education, Health, and Recreation for Men*
B.A. 1931, Occidental College; M.A. in Ed. 1941, George Washington University

Charles Rudolph Naeser, *Professor Emeritus of Chemistry*
B.S. 1931, University of Wisconsin; M.S. 1933, Ph.D. 1935, University of Illinois

Richard Norman Owens, *Professor Emeritus of Business Administration*
B.A., B.S. 1917, University of Missouri; M.A. 1922, Ph.D. 1928, University of Chicago; C.P.A. 1923, State of Illinois

Kittie Fenley Parker, *Professor Emeritus of Botany*
B.A. 1930, M.A. 1932, University of California, Berkeley; Ph.D. 1946, University of Arizona

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

Lois Irene Platt, *Associate Professor Emeritus of Pathology*
B.A. 1931, Goucher College; M.D. 1946, University of Maryland

Blake Smith Root, *Professor Emeritus of Education*
B.S. 1927, Monmouth College, Illinois; M.A. 1931, University of Illinois; Ed.D. 1948, George Washington University

Myrna Pauline Sedgwick, *Administrative Secretary Emeritus*
B.A. 1911, Wellesley College

Edward Henry Sehrt, *Professor Emeritus of German*
B.A. 1911, Ph.D. 1915, Johns Hopkins University

Ernest Sewall Shepard, *Professor Emeritus of English Literature*
B.A. 1925, M.A. 1927, George Washington University

Waldo Sommers, *Professor Emeritus of Public Administration*
B.A. 1927, Heidelberg College; M.A. 1934, Ph.D. 1948, Yale University

Edwin Lockwood Stevens, *Professor Emeritus of Speech*
B.A. 1936, Rutgers University, New Brunswick; M.A. 1942, Columbia University

Karl Ernest Stromsem, *Professor Emeritus of Public Administration*
B.A. 1930, Pomona College; Ph.D. 1935, University of California, Berkeley

Harold Griffith Sutton, *Director of Admissions Emeritus*
B.A. 1916, Ohio State University; M.S. 1921, Columbia University

Ira Rockwood Telford, *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Kathryn Mildred Towne, *Professor Emeritus of Home Economics*
B.S. 1923, Montana State University; M.A. 1930, Columbia University

William Lewis Turner, *Associate Professor Emeritus of English*
B.A. 1934, M.A. 1941, Ph.D. 1952, University of Pennsylvania

Donald Stevenson Watson, *Professor Emeritus of Economics*
B.A. 1930, University of British Columbia; Ph.D. 1935, University of California, Berkeley

Frank Mark Weida, *Professor Emeritus of Statistics*
B.S. 1913, Kenyon College; Ph.D. 1923, University of Iowa

Robert Louis Weintraub, *Professor Emeritus of Botany*
B.S. 1931, M.A. 1933, Ph.D. 1938, George Washington University

Warren Reed West, *Professor Emeritus of Political Science*
B.A. 1918, George Washington University; Ph.D. 1922, Johns Hopkins University

Ralph Kirby White, *Professor Emeritus of Social Psychology*
B.A. 1929, Wesleyan University; Ph.D. 1937, Stanford University

Marvin Milton Wofsey, *Professor Emeritus of Management*
B.S. 1935, New York University; M.A. 1943, Ph.D. 1967, American University

Samuel Nathaniel Wrenn, *Professor Emeritus of Chemistry*
B.A. 1927, M.A. 1929, Duke University; Ph.D. 1935, Pennsylvania State University

Lawson Edwin Yocum, *Professor Emeritus of Botany*
B.S. 1916, Pennsylvania State University, M.S. 1920, Ph.D. 1924, University of Northern Iowa

Donnell Brooks Young, *Professor Emeritus of Zoology*
B.S. 1911, Amherst College; Ph.D. 1923, Columbia University

ACTIVE*

Fred Paul Abramson, *Associate Professor of Pharmacology and of Pathology*
B.A. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

Eugene Abravanel, *Professor of Psychology*
B.A. 1955, University of Michigan; M.A. 1960, Swarthmore College; Ph.D. 1965, University of California, Berkeley

Jeanne Vermilyea Ackerman, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1948, Russell Sage College; M.A. in Ed. 1972, George Washington University

Elizabeth Byrne Adams, *Associate Professor of Management*
B.S. 1955, City University of New York, Queens College; M.A. in Ed. 1957, George Washington University; Ph.D. 1974, American University

Lewis Francis Affronti, *Professor of Microbiology*
B.A. 1950, M.A. 1951, State University of New York at Buffalo; Ph.D. 1958, Duke University

C. Michael Aho, *Assistant Professor of Economics*
B.A. 1971, University of Michigan

Johann Aigner, *Lecturer in Statistics*
B.S. 1972, Kepler University, Austria

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*
B.S. 1945, University of Baghdad, M.A. 1951, University of Texas at Austin; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Frank Duane Allan, *Professor of Anatomy*
B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

John Gage Allee, Jr., *Professor of English; Dean of the Division of University Students*
B.A. 1939, M.A. 1940, George Washington University; Ph.D. 1955, Johns Hopkins University

Willard Altman, *Assistant Professorial Lecturer in Mathematics*
B.S. 1967, Virginia Polytechnic Institute and State University; Ph.D. 1975, University of Virginia

David Aron Altshuler, *Assistant Professor of Religion*
B.A., M.A. 1971, Brown University; Ph.D. 1977, Hebrew Union College

Frederick Amling, *Professor of Business Finance*
B.A. 1948, Baldwin-Wallace College; M.B.A. 1949, Miami University; Ph.D. 1957, University of Pennsylvania

Jeffrey Clifford Anderson, *Assistant Professor of Art*
B.A. 1970, University of Pittsburgh; M.F.A. 1973, Ph.D. 1976, Princeton University

Rebecca Jane Anderson, *Assistant Professor of Pharmacology*
B.A. 1971, Coe College; Ph.D. 1978, Georgetown University

Avery Delano Andrews, *Associate Professor of History; Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1950, Harvard University; LL.B. 1953, M.A. 1958, Ph.D. 1962, University of Pennsylvania

John Lawrence Angel, *Professorial Lecturer in Anatomy and Anthropology*
B.A. 1936, Ph.D. 1942, Harvard University

Ricardo Anzola-Betancourt, *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.Arch. 1969, Cornell University

* The University Faculty is composed of the President of the University, the Vice President for Academic Affairs, the Director of Admissions, the Registrar, the University Librarian, the Treasurer, the Director of the Student Health Service, and the membership of the several college and school faculties.

Daniel Appleman, *Professorial Lecturer in Geology*
B.S. 1953, California Institute of Technology; M.A. 1954, Ph.D. 1956, Johns Hopkins University

Farlie Arant, *Assistant Professorial Lecturer in Speech*
B.A. 1957, Wellesley College; M.A. 1961, Columbia University; Ph.D. 1971, University of Minnesota

Joseph Aschheim, *Professor of Economics*
B.A. 1951, University of California, Berkeley; M.A. 1953, Ph.D. 1954, Harvard University

David Lynn Atkins, *Associate Professor of Biology*
B.A. 1957, University of Texas at Austin; M.A. 1963, East Texas State University; Ph.D. 1970, Texas A&M University

Philip Edward Austin, *Professorial Lecturer in Economics*
B.S. 1964, M.S. 1966, North Dakota State University; M.A. 1968, Ph.D. 1969, Michigan State University

Julius Axelrod, *Distinguished Professor of Science; Professorial Lecturer in Pharmacology*
B.S. 1933, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, LL.D. 1971, George Washington University; Sc.D. 1956, University of Chicago

*Ines Azar, *Assistant Professor of Spanish*
M.A. 1969, Ph.D. 1974, Johns Hopkins University

Joseph Baclawski, *Professorial Lecturer in Geography*
B.A. 1947, M.A. 1948, Ph.D. 1951, University of Michigan

Catherine Tudish Bader, *Lecturer in English*
B.A. 1971, M.A. 1973, University of Southern Illinois

John Bailar III, *Professorial Lecturer in Statistics*
B.A. 1953, University of Colorado; M.D. 1955, Yale University; Ph.D. 1973, American University

John Martyn Bailey, *Professor of Biochemistry*
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales

Robert Edward Baker, *Professor of Education; Assistant Dean of the School of Education*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1954, Catholic University of America; M.A. in Ed. 1956, Ed.D. 1962, George Washington University

Ruth Lillian Aaronson Bari, *Professor of Mathematics*
B.A. 1939, City University of New York, Brooklyn College; M.A. 1949, Ph.D. 1966, Johns Hopkins University

Shirley Russell Barnett, *Associate Professor of Spanish*
B.A. 1944, Vassar College; M.A. 1946, Vanderbilt University; Ph.D. 1958, University of Minnesota

James Richard Barth, *Associate Professor of Economics*
B.A. 1965, California State University at Sacramento; M.A. 1967, University of New Mexico; Ph.D. 1972, Ohio State University

Ken Alexander Baskin, *Lecturer in English*
B.A. 1969, University of Maryland; M.A. 1971, Pennsylvania State University

Elio Lee Battaglia, *Assistant Professorial Lecturer in Photography*
B.J. 1956, M.A. 1968, University of Missouri

Samuel Baum, *Professorial Lecturer in Geography and Regional Science*
B.A. 1950, City University of New York, Brooklyn College

Vivian Hazlett Beard, *Adjunct Assistant Professor of English*
B.A. 1974, M.A., M.S. 1975, University of Pennsylvania

Caroline Gardner Beckjord, *Lecturer in English*
B.A. 1953, Vassar College; M.A. 1968, Carnegie-Mellon University

Norman Beckman, *Professorial Lecturer in Urban and Regional Planning*
B.A. 1949, City University of New York, Brooklyn College; M.A. 1952, Syracuse University; Ph.D. 1957, Columbia University

David Booth Beers, *Assistant Professorial Lecturer in Classics*
B.A. 1957, Trinity College, Connecticut; M.A., LL.B. 1960, University of California, Berkeley

* On sabbatical leave spring semester 1978.

Fernando Belaunde-Terry, *Visiting Professor of Urban History and Planning*
B.Arch. 1935, University of Texas at Austin; Doctor honoris causa 1964, National Agrarian University, Peru; LL.D. 1969, Hamilton College; D.F.A. 1975, Our Lady of the Lake University

Salvatore John Bellomo, *Professorial Lecturer in Urban and Regional Planning*
B.S. 1963, Rutgers University, New Brunswick; M.C.E. 1967, D.Engr. 1971, Catholic University of America

Bruce Benefield, *Associate Professorial Lecturer in Business Administration*
B.B.A. 1951, University of Miami; M.S. 1964, Air Force Institute of Technology; D.B.A. 1968, Harvard University

Robert Stephen Bennett, *Assistant Professorial Lecturer in Forensic Sciences*
LL.B 1964, Georgetown University; LL.M. 1965, Harvard University

Clifford Leonard Berg, *Professorial Lecturer in Public Administration*
B.A. 1942, University of Minnesota; M.P.A. 1951, Ph.D. 1955, Harvard University

Otto Bergmann, *Professor of Physics*
Ph.D. 1949, University of Vienna

David Francis Bergwall, *Instructor in Health Care Administration*
B.A. 1969, M.B.A. 1970, Ball State University

Lee Sheward Bielski, *Associate Professor of Speech*
B.S. 1940, Ohio University; M.A. 1944, University of Michigan

Philip Stanley Birnbaum, *Adjunct Associate Professor of Health Care Administration; Dean for Administrative Affairs of the Medical Center*
B.S. in M.E. 1948, M.S. in M.E. 1949, Carnegie-Mellon University; B.C.E. 1954, Rensselaer Polytechnic Institute

Guy Black, *Professor of Business Economics*
B.S. 1941, Harvard University; M.A. 1948, Ph.D. 1951, University of Chicago

Ronald Wayne Black, *Adjunct Instructor in Health Care Administration*
B.S. 1964, Sam Houston State University; M.B.A. 1974, Wagner College

Elaine Bloomfield, *Adjunct Assistant Professor of Women's Studies*
B.A. 1967, Case Western Reserve University; J.D. 1971, George Washington University

Elliot Blum, *Associate Clinical Professor of Psychology*
B.B.A. 1958, City University of New York, City College; M.S. 1960, Long Island University; Ph.D. 1965, Florida State University

George Bodnar, *Assistant Professor of Accounting*
B.S., B.A. 1970, Bucknell University; M.B.A. 1973, Ph.D. 1975, University of Pennsylvania

Margaret Emma Boeckmann, *Assistant Professor of Sociology*
B.A. 1964, Barnard College; M.A.T. 1965, Ph.D. 1973, Johns Hopkins University

Roland Richard Bonato, *Associate Research Professor of Health Care Administration*
B.A. 1954, Case Western Reserve University; M.A. 1957, Ph.D. 1961, University of Connecticut

John Borriello, *Associate Clinical Professor of Psychology*
B.A. 1952, M.Ed. 1953, Boston University; Ph.D. 1957, University of Minnesota

*John Gordon Boswell, *Professor of Education*
B.A. in Ed. 1953, M.A. in Ed. 1956, Ed.D. 1963, George Washington University

Perry Botwin, *Professor of Special Education*
B.S. 1942, Rutgers University, New Brunswick; M.A. 1947, New York University; Ed.D. 1957, Columbia University

Lloyd Spencer Bowling, *Professor of Speech and Hearing*
B.A. 1954, M.A. 1957, Ed.D. 1964, University of Maryland

Thomas Elliot Bowman, *Adjunct Professor of Biological Sciences*
B.S. 1941, Harvard University; M.A. 1948, University of California, Berkeley; Ph.D. 1954, University of California, Los Angeles

* On sabbatical leave spring semester 1978.

George Robert Bozzini, *Assistant Professor of English*
B.S. 1961, Ph.D. 1971, Georgetown University

Linda Brandt, *Assistant Professor of Psychology*
B.A. 1963 Elmhurst College; M.A. 1965 Clark University; Ph.D. 1973, University of London

James Lowell Breen, *Professor of Human Kinetics and Leisure Studies*
B.S. 1948, Eastern Illinois University; M.S. 1949, Ph.D. 1959, University of Illinois

*Marcella Brenner, *Professor of Education*
B.S. in Ed. 1934, Johns Hopkins University; M.A. 1949, American University; Ed.D. 1962, George Washington University

Mary Diane Majerus Brewer, *Associate Professor of Speech*
B.A. 1963, M.A. 1965, University of Iowa

Harold Frederick Bright, *Professor of Statistics; Provost and Vice President for Academic Affairs*
B.A. 1937, Lake Forest College, M.S. 1944, University of Rochester; Ph.D. 1952, University of Texas at Austin

A. D. Britt, *Associate Professor of Chemistry*
B.S. 1957, West Texas State University; M.A. 1961, Ph.D. 1963, Washington University

John Caruthers Broderick, *Adjunct Professor of English*
B.A. 1948, Southwestern at Memphis, M.A. 1949, Ph.D. 1953, University of North Carolina

Stuart Lee Brodsky, *Associate Professorial Lecturer in Mathematics*
B.S. 1964, Illinois Institute of Technology; M.S. 1965, Ph.D. 1969, Stanford University

Alison Spence Brooks, *Assistant Professor of Anthropology*
B.A. 1965, Radcliffe College; M.A. 1967, Harvard University

Barry Lee Brown, *Assistant Professorial Lecturer in Biological Sciences*
B.S.A. 1966, M.S. 1968, University of Georgia; Ph.D. 1972, Purdue University

David Alan Brown, *Professorial Lecturer in Art*
B.A. 1964, Harvard University; M.A. 1967, Ph.D. 1973, Yale University

David Springer Brown, *Professor of Management*
B.A. 1936, University of Maine at Orono; Ph.D. 1955, Syracuse University

Laurence Ray Brown, *Assistant Professorial Lecturer in Business Administration*
B.S. in Engr. 1949, D.B.A. 1968, George Washington University; LL.B. 1951, Rutgers University, Camden; M.S. in E.E. 1958, University of Pennsylvania

Robert Guy Brown, *Professor of Sociology*
B.A. 1949, University of Rhode Island; M.A. 1951, Ph.D. 1960, University of North Carolina at Chapel Hill

Arnold Rahn Bruhn, *Assistant Professor of Psychology*
B.A. 1963, M.A. 1966, University of Portland; Ph.D. 1976, Duke University

John Evan Bruhn, *Adjunct Instructor in Health Care Administration*
B.S. 1975, M.B.A. 1976, George Washington University

Richard Brunelle, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1960, Clark University; M.S. 1972, George Washington University

David Brusick, *Adjunct Assistant Professor of Genetics*
B.S. 1963, University of Illinois; M.S. 1965, Ph.D. 1970, Illinois State University

Eugene Marcus Bryant, Jr., *Adjunct Assistant Professor of Health Care Administration*
B.A. 1961, M.A. 1965, George Washington University

Ben Burdetsky, *Professor of Personnel and Labor Relations*
B.S. 1950, M.S. 1956, Temple University; Ph.D. 1966, American University

David Warren Burkett, *Associate Professorial Lecturer in Journalism*
B.J. 1951, M.J. 1965, University of Texas at Austin

Elisabeth Ann Burkhardt, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1966, University of Maryland

* On leave of absence spring semester 1978.

James Franklin Burks, *Professor of French*
B.A. 1951, M.A. 1952, University of Cincinnati; Ph.D. 1957, Indiana University at Bloomington

Stephen Wheeler Burks, *Assistant Professor of Political Science and Public Affairs*
B.A. 1962, Stanford University; M.A. 1969, Ph.D. 1972, Michigan State University

Martha Burns, *Associate Professor of Education*
B.S. 1964, University of Bridgeport; M.Ed. 1967, Ed.D. 1971, Pennsylvania State University

Martin Alexander Buzas, *Associate Professorial Lecturer in Geology*
B.A. 1958, University of Connecticut; M.S. 1960, Brown University; Ph.D. 1963, Yale University

Willard Edmund Caldwell, *Professor of Psychology*
B.A. 1940, M.A. 1941, University of Florida; Ph.D. 1946, Cornell University

Robert Samuel Capps, *Adjunct Instructor in Accounting*
B.S. 1948, University of California, Berkeley; M.B.A. 1959, University of Southern California

Edward Alan Caress, *Associate Professor of Chemistry; Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1958, Dartmouth College; Ph.D. 1963, University of Rochester

Rose Friedman Caron, *Adjunct Professor of Psychology*
B.A. 1948, Vassar College; M.A. 1950, Ph.D. 1955, University of Chicago

Gerald Vincent Carroll, *Professor of Geology*
B.A. 1943, Lehigh University; Ph.D. 1952, Yale University

Thomas Frank Carroll, *Adjunct Professor of Economics*
B.A. 1942, Case Western Reserve University; M.S. 1947, Ph.D. 1950, Cornell University

Franklin Wood Carter, *Adjunct Instructor in Health Care Administration*
B.S. in Gen. Std. 1970, M.B.A. 1971, George Washington University

Geoffrey Carter, *Assistant Professor of English*
B.A. 1963, Cambridge University; Ph.D. 1969, University of Pennsylvania

Marie Mullaney Cassidy, *Professor of Physiology*
B.S. (General) 1957, B.S. (Special) 1958, M.S. 1959, Ph.D. 1962, National University of Ireland

Michael Scott Castleberry, *Assistant Professor of Special Education*
B.A. 1966, University of North Carolina, M.A. in Ed. 1972, Ed.D. 1973, George Washington University

Bayard Lacey Catron, *Assistant Professor of Public Administration*
B.A. 1963, Grinnell College, M.A. 1965, University of Chicago, M.C.P. 1972, Ph.D. 1975, University of California, Berkeley

Soo Young Cha, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1961, Seoul National University

Fenner Albert Chace, Jr., *Adjunct Professor of Biological Sciences*
B.A. 1930, M.A. 1931, Ph.D. 1934, Harvard University

William Weymouth Chase, *Professorial Lecturer in Education*
B.A. 1948, M.A. 1949, Colorado State College; Ed.D. 1956, Indiana University at Bloomington

George Cheely, *Professorial Lecturer in Journalism*
B.S. 1952, University of Maryland

Stephen Reed Chitwood, *Associate Professor of Public Administration*
B.A. 1962, University of Colorado; M.P.A. 1965, Ph.D. 1966, University of Southern California

Yang-Ming Chu, *Associate Research Professor of Microbiology*
B.S. 1959, University of Washington, M.S. 1964, Ph.D. 1967, George Washington University

Robert Paul Churchill, *Assistant Professor of Philosophy*
B.A. 1969, M.A. 1972, Ph.D. 1974, Johns Hopkins University

*Ira Hubert Cisin, *Professor of Sociology*
B.S. 1939, New York University; M.A. 1951, Ph.D. 1957, American University

Astere Evarist Claeyssens, Jr., *Associate Professor of English*
B.A. 1948, University of Illinois; M.A. 1952, Columbia University

*On sabbatical leave academic year 1977-78.

Patricia Ann Cleary, *Research Instructor in Health Care Administration*
B.A. in Ed. 1966, M.S. 1968, George Washington University

Betty Jo Clifford, *Clinical Instructor in Art Therapy*
M.S. in Art Ed. 1965, State University of New York at Buffalo

Anthony George Coates, *Professor of Geology*
B.S. 1959, Ph.D. 1963, University of London

Joseph Francis Coates, *Professorial Lecturer in Management Science and Public Affairs*
B.S. 1951, Polytechnic Institute of Brooklyn; M.S. 1953, Pennsylvania State University

Vary Taylor Coates, *Adjunct Associate Professor of Public Affairs*
B.A. 1957, Furman University; M.A. 1966, Ph.D. 1972, George Washington University

Mary Ann Bieter Coffland, *Associate Professor of Romance Languages*
B.A. 1952, College of St. Catherine; M.A. 1957, Ph.D. 1965, University of Minnesota

Stanley Lee Cohen, *Associate Professorial Lecturer in Psychology*
B.A. 1963, M.A. 1966, Ph.D. 1971, George Washington University

Victor Hugo Cohn, *Professor of Pharmacology*
B.S. 1952, Lehigh University; M.A. 1954, Harvard University; Ph.D. 1961, George Washington University

James Coldsmith, *Associate Professorial Lecturer in Journalism*
B.A. 1950, Baker University; M.S.J. 1951, Northwestern University

Richard Louis Cole, *Assistant Professor of Political Science and Public Affairs*
B.A. 1967, M.A. 1969, North Texas State University; Ph.D. 1973, Purdue University

Mary Ellen Coleman, *Professor of Education*
B.S. 1937, Madison College; M.A. in Ed. 1950, George Washington University

Frederick Joseph Collier, *Assistant Professorial Lecturer in Geology*
B.S. 1956, Tufts University

Patrick Joseph Collier, *Adjunct Assistant Professor of Health Care Administration*
B.S. 1963, Naval Postgraduate School; M.S. in Per.Adm. 1967, George Washington University

Leonard Cornelius Collins, *Professorial Lecturer in Business Administration*
B.A. 1943, Boston College, LL.B. 1946, Catholic University of America; LL.M. 1953, Georgetown University

*Robert Long Combs, *Assistant Professor of English*
B.A. 1968, University of Southern Mississippi, Ph.D. 1971, University of South Carolina

David Michael Compton, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1963, California State University, Chico; M.S. 1964, Indiana University; Ed.D. 1973, University of Utah

Sharon Louise Connelly, *Adjunct Assistant Professor of Women's Studies*
B.A. 1967, Smith College; M.Mgt. 1973, Vanderbilt University

Howard Lee Coppenbarger, *Professorial Lecturer in Journalism*

Joseph John Cordes, *Assistant Professor of Economics*
B.A. 1971, Stanford University; M.S. 1975, University of Wisconsin

Jerome Cornfield, *Professor of Statistics*
B.S. 1933, New York University

Erminio Costa, *Professorial Lecturer in Pharmacology*
M.D. 1947, University of Cagliari, Italy

Constance Christian Costigan, *Assistant Professor of Design*
B.S. 1957, Simmons College; M.A. 1965, American University

Kenneth Cotton, *Lecturer in Human Kinetics and Leisure Studies*

Raymond Sheary Cottrell, Jr., *Professor of Special Education*
B.S. 1955, State University of New York at Albany; M.S. 1959, Ed.D. 1967, Syracuse University

* On sabbatical leave spring semester 1976

Raymond Leslie Courage, *Associate Professorial Lecturer in Journalism*
B.A. 1949, M.A. 1951, University of Michigan

Thomas Francis Courtless, Jr., *Professor of Law and Sociology*
B.A. 1955, Pennsylvania State University; M.A. 1960, Ph.D. 1966, University of Maryland

John Patrick Coyne, *Associate Professor of Management Science*
B.S. 1967, Iona College; M.S. 1968, Ph.D. 1970, Lehigh University

Robert Warren Crandall, *Associate Professorial Lecturer in Economics*
B.A. 1962, University of Cincinnati; M.S. 1965, Ph.D. 1968, Northwestern University

David Allan Crown, *Professorial Lecturer in Forensic Sciences*
B.S. 1948, Union College; M.Crim. 1960, D. Crim. 1969, University of California

Ronald Crystal, *Adjunct Professor of Genetics*
B.A. 1962, Tufts University; M.S. 1963, M.D. 1966, University of Pennsylvania

Jonathan Walkley Cummings, *Associate Clinical Professor of Psychology*
B.A. 1949, University of Vermont; Ph.D. 1954, University of Illinois

Phyllis Deutsch Daen, *Associate Clinical Professor of Psychology*
B.S. 1950, City University of New York, Queens College; Ph.D. 1960, Adelphi University

Robert Emmett Darcy, *Assistant Professor of Political Science and Public Affairs*
B.A. 1965, University of Wisconsin; M.A. 1970, Ph.D. 1971, University of Kentucky

Kurt John Darr, *Associate Professor of Health Care Administration; Assistant Dean of the School of Government and Business Administration*
B.A. 1961, Concordia College, Minnesota; J.D. 1964, M.H.A. 1966, University of Minnesota; D.Sc. 1973, Johns Hopkins University

Calvin O'Neil Dash, *Studio Lecturer in Applied Music (Voice)*
B.S. 1951, M.S. 1952, Juilliard School of Music; A.Mus.D. 1962, Eastman Schol of Music

Philip Gardner Davidoff, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, M.A. 1963, University of Pennsylvania

Walter Navarro Davis, *Assistant Professorial Lecturer in Education*
B.A. 1956, North Carolina Central University; M.A. in Ed. 1969, George Washington University; Ed.D. 1975, American University

*Roderic Hollett Davison, *Professor of European History*
B.A. 1937, Princeton University; M.A. 1938, Ph.D. 1942, Harvard University

Barbara Dawson, *Assistant Professor of Management Science*
B.B.A. 1972, M.B.A. 1974, D.B.A. 1976, Kent State University

Diana Dawson, *Assistant Professorial Lecturer in Art*
B.F.A. 1966, George Washington University

Eugene Richard Declercq, *Assistant Professor of Political Science*
B.S. 1970, Lowell Technological Institute; M.B.A. 1971, University of Massachusetts; M.S. 1972, Ph.D. 1974, Florida State University

Rosalie Frances De Giovanni-Donnelly, *Assistant Research Professor of Microbiology*
B.A. 1947, M.A. 1953, City University of New York, Brooklyn College; Ph.D. 1961, Columbia University

Harold Charles Demoody, *Adjunct Associate Professor of Management*
B.A. 1956, University of Connecticut, M.B.A. 1960, Air Force Institute of Technology; M.P.A. 1969, American University

Frank Landt Dennis, *Professorial Lecturer in Journalism*
B.A. 1929, University of Oklahoma; LL.B. 1935, Harvard University

Linda Grant DePauw, *Professor of American History*
B.A. 1961, Swarthmore College; Ph.D. 1964, Johns Hopkins University

Alton Harold Desmond, *Professor of Zoology and of Forensic Sciences*
B.S. 1949, Hartwick College; M.S. 1951, Ph.D. 1954, Brown University

Milton Charles Devolites, *Professor of Health Care Administration*
B.A. 1938, Harvard University; M.A. 1953, Baylor University

*On sabbatical leave academic year 1977-78.

Jessie Carleton Calver Dickens, *Associate Professorial Lecturer in Biological Sciences*
B.A. 1939, M.S. 1969, George Washington University

Antoinette LaVerne Dickerson, *Associate Research Professor of Human Kinetics and Leisure Studies*
B.S. 1958, Virginia State College; M.A. 1959, Ed.D. 1973, New York University

Hasia Schwartzman Diner, *Visiting Assistant Professor of American Civilization*
B.A. 1968, University of Wisconsin; M.A.T. 1970, University of Chicago; Ph.D. 1975, University of Illinois at Chicago Circle

John Phillip Dirkse III, *Assistant Professor of Statistics*
B.S. 1969, University of Wisconsin-Oshkosh; M.S. 1971, Ph.D. 1973, Purdue University

Salvatore Frank Divita, *Associate Professor of Business Administration*
B.I.E. 1953, New York University; M.B.A. 1956, Ohio State University; D.B.A. 1968, Harvard University

Wallace Bruce Dobry, *Studio Lecturer in Applied Music (Piano and Organ)*
Mus.B. 1956, Peabody Institute of the City of Baltimore

Edmond Joseph Donnellan, *Clinical Instructor in Art Therapy*
B.A. 1965, Georgetown University; M.D. 1969, Cornell University

Jesse Frank Doubleday, *Professorial Lecturer in Business Administration*
B.S. 1954, University of Maryland; M.A. 1955, George Washington University

Miriam Violet Wein Dow, *Lecturer in English*
B.A. 1959, University of Akron; M.A. 1960, University of Michigan

Allan Drexler, *Professorial Lecturer in Education*
B.S. 1950, Long Island University; M.S. 1952, Pennsylvania State University; Ph.D. 1958 Purdue University

Daniel Maccabaeus Dribin, *Professorial Lecturer in Mathematics*
B.S. 1933, M.S. 1934, Ph.D. 1936, University of Chicago

Robert Martin Dunn, Jr., *Professor of Economics*
B.A. 1960, Williams College; M.A. 1963, Ph.D. 1967, Stanford University

Marshall Sol Duny, *Adjunct Instructor in Health Care Administration*
B.A. 1973, George Washington University; M.S. 1976, Naval Postgraduate School

Robert Frederick Dyer, *Associate Professor of Business Administration*
B.S. in B.A. 1965, M.B.A. 1966, Bowling Green State University; D.B.A. 1972, University of Maryland

Roy Brandon Eastin, *Professor of Business Administration*
B.A. 1943, M.A. 1945, George Washington University; Ph.D. 1953, American University

John Walter Eberhard, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1955, St. Joseph's College, Pennsylvania; M.A. 1958, Ph.D. 1965, Fordham University

David Lee Edgell, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1961, University of Kansas; B.A. 1968, American University; M.A. 1970, Indiana University; Ph.D. 1976, University of Cincinnati

Gordon Stuart Edwards, *Assistant Professor of Pharmacology*
B.A. 1959, Amherst College; M.A. 1962, Harvard University; Sc.D. 1970, Massachusetts Institute of Technology

Julian Eisenstein, *Professor of Physics*
B.S. 1941, M.A. 1942, Ph.D. 1948, Harvard University

Adel El-Ansary, *Professor of Marketing and Business Administration*
B.Com. 1962, Cairo University, Egypt; M.B.A. 1968, Ph.D. 1970, Ohio State University

Marlene Kay Elbin, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1967, University of Maryland

Rodney Eldridge, *Associate Professor of International Finance*
B.A. 1949, M.A. 1959, University of Vermont; Ph.D. 1966, Columbia University

Charles Fox Elliott, *Associate Professor of Political Science and International Affairs*
B.A. 1953, Ph.D. 1964, Harvard University; M.A. 1958, University of California, Berkeley

Lloyd Hartman Elliott, *Professor of Higher Education; President of the University*
B.A. 1937, Glenville State College; M.A. 1939, LL.D. 1967, West Virginia University; Ed.D. 1948, University of Colorado; LL.D. 1963, University of New Hampshire; LL.D. 1965, Colby College; LL.D. 1966, Concord College; LL.D. 1969, University of Maine at Orono; LL.D. 1971, Georgetown University

Richard Ferdinand Ericson, *Professor of Management*
B.A. 1943, M.B.A. 1946, University of Chicago; Ph.D. 1952, Indiana University at Bloomington

Grace Elizabeth Orvis Evans, *Professorial Lecturer in Art*
B.A. 1943, M.A. 1946, University of Minnesota

Grose Evans, *Adjunct Associate Professor of Art*
B.F.A. 1939, M.A. 1940, Ohio State University; Ph.D. 1953, Johns Hopkins University

Sergio Egidio Fabro, *Professor of Obstetrics and Gynecology and Research Professor of Pharmacolgy*
M.D. 1956, University of Milan; Ph.D. 1966, Ph.D. 1968, University of Rome; Ph.D. 1967, University of London

Bernice Feinstein, *Assistant Professorial Lecturer in Music*
B.A. 1947, Smith College; M.A. 1958, Ed.D. 1972, Columbia University

Sima Ficks, *Lecturer in Russian*
Diploma 1964, Kiev State University

Nicolae Filipescu, *Professor of Chemistry*
Ph.D. 1957, University of Industrial Chemistry, Polytechnical Institute, Rumania; Ph.D. 1964, M.D. 1975, George Washington University

Dana Fischer, *Assistant Professor of Political Science and International Affairs*
B.A. 1965, Lewis and Clark College; M.A. 1968, Ph.D. 1973, University of Washington

Roland Fischer, *Professorial Lecturer in Pharmacology*
M.S., Ph.D., 1945, University of Basel, Switzerland

Joseph Lyman Fisher, *Adjunct Professor of Economics*
B.S. 1945, Bowdoin College; M.A. 1938, Ph.D. 1947, Harvard University; M.A. in Ed. 1951, George Washington University

Stephen Todd Fisher, *Adjunct Assistant Professor of Health Care Administration*
B.A. 1963, Washington and Jefferson College; M.B.A. 1965, Cornell University

Sadie Fishman, *Clinical Instructor in Art Therapy*
B.F.A. 1974, Maryland Institute College of Art; M.A. 1975, George Washington University

William Gary Flamm, *Adjunct Professor of Genetics*
B.S. 1957, M.S. 1959, Ph.D. 1962, University of Cincinnati

Joseph William Fleck, *Associate Professor of Education*
B.A. 1957, City University of New York, Queens College; M.Ed. 1969, Central State University, Ph.D. 1975, University of Oklahoma

William Robert Fonda, *Assistant Professorial Lecturer in Journalism*

Ernest Harvey Forman, *Assistant Professor of Management Science*
B.S. 1964, University of Rochester; M.S. 1969, Johns Hopkins University; D.Sc. 1975, George Washington University

John Robert Fowle III, *Lecturer in Biological Sciences*
B.A. 1971, George Washington University

Martin Frank, *Assistant Professor of Physiology*
B.A. 1969, M.S. 1971, Ph.D. 1973, University of Illinois

Richard John Frankie, *Professor of Education*
B.A. 1952, M.A. 1955, University of Michigan; Ed.D. 1966, Wayne State University

John Eric Fredland, *Associate Professorial Lecturer in Economics*
B.A. 1964, Harvard University; M.A. 1966, Ph.D. 1970, University of Michigan

Roderick Stuart French, *Associate Professor of Philosophy; Director, Division of Experimental Programs*
B.A. 1954, Kenyon College; B.D. 1957, Episcopal Theological School; S.T.M. 1965, Union Theological Seminary; Ph.D. 1971, George Washington University

John Andrew Frey, *Professor of Romance Languages*
B.A. 1951, M.A. 1952, University of Cincinnati; Ph.D. 1957, Catholic University of America

Thomas Baer Friedman, *Adjunct Assistant Professor of Genetics*
B.S. 1967, Ph.D. 1971, University of Michigan

William Edward Fuhrman, *Studio Lecturer in Applied Music (Flute)*
Mus.B. 1968, Catholic University of America

Stephen Souther Fuller, *Associate Professor of Urban Planning*
B.A. 1962, Rutgers University, New Brunswick; M.C.P. 1964, University of Mississippi; Ph.D. 1969, Cornell University

Carol Susan Jonas Gage, *Lecturer in Education*
B.A. 1968, Finch College; M.A. 1970, New York University; M.A. in Ed. 1974, George Washington University

Dennis Gale, *Assistant Professor of Urban and Regional Planning*
B.A. 1964, Bucknell University; M.S. 1968, Boston University; M.Ed. 1969, Harvard University; M.C.P. 1971, University of Pennsylvania

Michael Graham Gallagher, *Associate Professor of Accounting*
B.A. in Govt. 1960, J.D. 1964, LL.M. 1971, George Washington University; C.P.A. 1965, State of Virginia

Linda Lou Gallo, *Assistant Professor of Biochemistry*
B.A. 1966, North Texas State University; M.A. 1974, George Washington University

Robert Charles Gallo, *Adjunct Professor of Genetics*
B.A. 1959, Providence College; M.D. 1963, Thomas Jefferson University

Linda Gantt, *Clinical Instructor in Art Therapy*
B.A. 1966, North Texas State University; M.A. 1974, George Washington University

*Robert Norton Ganz, Jr., *Professor of English*
B.A. 1949, M.A. 1951, Ph.D. 1959, Harvard University

Blanche Hatfield Gardner, *Lecturer in German*
B.A. 1940, Mount Holyoke College; M.A. 1942, University of Wisconsin

Daniel Dee Garner, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1969, David Lipscomb College; Ph.D. 1973, University of Tennessee

Nathan Conant Garner, *Assistant Professor of Drama; Acting Director of Theater*
B.A. 1963, Tufts University; M.A. 1966, University of North Carolina

Joseph Lewis Gastwirth, *Professor of Statistics and Economics*
B.S. 1958, Yale University; M.A. 1960, Princeton University; Ph.D. 1963, Columbia University

Harry Irving Gates, *Assistant Professor of Sculpture*
B.F.A. 1958, M.F.A. 1960, University of Illinois

James David Gates, *Assistant Professorial Lecturer in Education*
B.A. 1951, Hiram College; M.A. 1956, Columbia University; Ed.D. 1975, George Washington University

Marjorie Gazvoda, *Research Instructor in Education*
Ed.B. 1960, Waynesboro College; M.A. in Ed. 1974, George Washington University

John Joseph Geer, *Adjunct Assistant Professor of Health Care Administration*
B.S. 1965, J.D. 1968, Fordham University; M.S.F.S. 1974, George Washington University

Alfonso Geiger, *Associate Professorial Lecturer in Geology*
B.S. 1950, University of Michigan

Lyndale Harpster George, *Associate Professor of Human Kinetics and Leisure Studies*
B.S. in P.E. 1948, M.A. in Ed. 1952, A.P.C. 1961, George Washington University

* On sabbatical leave spring semester 1978.

David Gillespie, *Adjunct Professor of Genetics*
B.S. 1961, Tufts University; Ph.D. 1966, University of Illinois

Howard Frank Gillette, Jr., *Assistant Professor of American Civilization*
B.A. 1964, Ph.D. 1970, Yale University

Leon Gintzig, *Professor of Hospital Administration*
B.S. 1947, Boston University; M.S. 1954, Northwestern University; Ph.D. 1958, University of Iowa

Bernard Sholom Glassman, *Associate Professorial Lecture in Art*
B.S. 1943, Harvard University

Irving Isadore Glick, *Associate Professor of Mathematics*
B.A. 1953, Johns Hopkins University; Ph.D. 1961, University of Maryland

Joseph Garrett Glover, *Assistant Professorial Lecturer in Journalism*
B.A. 1968, Georgetown University; M.F.A. 1974, Catholic University of America

Joe Jeff Goldblatt, *Lecturer in Human Kinetics and Leisure Studies*
B.P.A. 1974, St. Edward's University

Robert Stanley Goldfarb, *Associate Professor of Economics*
B.A. 1964, Columbia University; M.A. 1965, M.Phil. 1967, Ph.D. 1968, Yale University

Victor Karl Golla, *Associate Professor of Anthropology*
B.A. 1960, Ph.D. 1970, University of California, Berkeley

Robert Golten, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1954, University of Michigan; LL.B. 1959, Harvard University

Charles Vance Gordon, Jr., *Adjunct Assistant Professor of Health Care Administration*
B.A. 1967, University of Colorado; Ph.D. 1971, Washington University

Marvin Gordon, *Professor of Geography and Regional Science*
B.A. 1942, City University of New York, City College; M.A. 1954, Ph.D. 1966, Columbia University

Marvin David Green, *Associate Professor of Mathematics*
B.S. 1961, M.A. 1962, Ph.D. 1965, University of Cincinnati

Maureen Flanagan Green, *Assistant Professorial Lecturer in English*
B.A. 1966, University of Massachusetts; M.A. 1968, Ph.D. 1973, University of Wisconsin

Susan Kay Green, *Assistant Professor of Psychology*
B.A. 1971, Michigan State University; M.A. 1973, Ph.D. 1975, Loyola University of Chicago

William James Green, Jr., *Adjunct Associate Professor of Health Care Administration*
B.A. 1958, Georgetown University; M.H.A. 1962, University of Minnesota

Joseph Arthur Greenberg, *Assistant Professor of Education*
B.S. in Bus. Ed. 1966, Salem State College; Ed.M. 1968, Ed.D. 1974, Boston University

John Greene, *Lecturer in English*
B.A. 1972, University College, Ireland.

Sherwin Greene, *Associate Professor of Urban Planning*
B.Arch. 1959, M.S. in C.R.P. 1960, Illinois Institute of Technology

Samuel W. Greenhouse, *Professor of Statistics*
B.S. 1939, City University of New York, City College; M.A. 1954, Ph.D. 1959, George Washington University

Candice Hart Greer, *Adjunct Assistant Professor of English*
B.A. 1972, George Washington University; M.A. 1975, University of Pennsylvania

N. Taylor Gregg, *Associate Professorial Lecturer in Journalism*

Fuller Griffith, *Assistant Professor of Graphics*
B.S. 1952, University of Wisconsin; M.F.A. 1969, George Washington University

*William Byron Griffith, *Associate Professor of Philosophy*
B.A. 1956, University of Notre Dame; M.A. 1962, Ph.D. 1963, Yale University

*On sabbatical leave spring semester 1978.

Phillip Donald Grub, *Aryamehr Professor of Multinational Management Assistant to the President for International Programs*
B.A., B.A. in Ed. 1953, Eastern Washington State College; M.B.A. 1960, D.B.A. 1964, George Washington University

Francis Stanley Grubar, *Professor of Art*
B.A. 1948, M.A. 1949, University of Maryland; M.A. 1952, Ph.D. 1966, Johns Hopkins University

Joseph Grunwald, *Adjunct Professor of Economics*
B.S. 1943, Johns Hopkins University; Ph.D. 1950, Columbia University

Margaret Beltz Guenther, *Associate Professorial Lecturer in German*
B.A. 1950, M.A. 1953, University of Kansas; Ph.D. 1958, Radcliffe College

Roy James Guenther, *Assistant Professorial Lecturer in Music*
B.Mus.Ed. 1966, Mus.B. 1968, University of Kansas, M.A. 1974, Catholic University of America

Frederick Gutheim, *Adjunct Professor of Urban Planning and American Civilization*
B.A. 1931, University of Wisconsin

William Henry Guy, *Assistant Research Professor of Health Care Administration*
B.A. 1947, Northeastern University; M.A. 1948, Boston University; Ph.D. 1967, George Washington University

Andrew Gyorgy, *Professor of International Affairs and Political Science*
B.A. 1937, J.D. 1938, University of Budapest, M.A. 1939, University of California, Berkeley; Ph.D. 1943, University of California, Los Angeles

Sheldon Edward Haber, *Associate Professor of Economics*
B.A. 1954, City University of New York, City College; Ph.D. 1958, Johns Hopkins University

Marilyn Hacker, *Jenny McKean Moore Visiting Lecturer in Creative Writing*
B.A. 1965, New York University

Eleanor Martha Hadley, *Professorial Lecturer in Economics*
B.A. 1938, Mills College; M.A. 1943, Ph.D. 1949, Harvard University

Neil Blaine Hadley, *Assistant Professorial Lecturer in Health Care Administration*
B.A. 1949, University of Northern Iowa; M.H.A. 1958, Baylor University; M.S. 1962, Arizona State University; D.B.A. 1971, George Washington University

Robert Arthur Hadley, *Associate Professor of History*
B.A. 1959, Bowdoin College; M.A. 1960, Ph.D. 1964, University of Pennsylvania

Fred Ernst Hahn, *Professorial Lecturer in Pharmacology*
Ph.D. 1948, University of Kiel, Germany

Abraham Halpern, *Adjunct Professor of International Affairs*
B.A. 1933, Harvard University; Ph.D. 1947, University of Chicago

Alam Hammad, *Adjunct Instructor in Accounting*
B.Com. 1965, Cairo Polytechnic Institute; M.S. 1971, Louisiana State University

William Charles Handorf, *Associate Professor of Business Administration*
B.A. 1966, M.B.A. 1967, University of Michigan; Ph.D. 1973, Michigan State University

Margie Rosann Hanson, *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1943, University of Minnesota; M.S. 1946, University of California, Los Angeles; Ph.D. 1965, University of Washington

Harold Cecil Harder, *Assistant Professor of Pharmacology*
B.S. 1964, Alma College, Michigan; M.S. 1966, Ph.D. 1970, Michigan State University

William Walter Hardgrave, *Associate Professor of Management Science*
B.A. 1959, Princeton University; D.Engr. 1962, Johns Hopkins University

John Hardt, *Professorial Lecturer in Economics*
B.A. 1945, M.A. 1948, University of Washington; M.A. 1950, Ph.D. 1955, Columbia University

Michael Mont Harmon, *Associate Professor of Public Administration*
B.A. 1963, Utah State University; M.P.A. 1966, Ph.D. 1966, University of Southern California

Carolee Hartman, *Lecturer in English*
B.A. 1970, Barnard College; M.A. 1973, George Washington University

Jerry Harvey, *Professor of Management Science*
B.B.A. 1967, Ph.D. 1969, University of Texas at Austin

Shahin Hashtroudi, *Assistant Professor of Psychology*
B.A. 1971, American University of Beirut; Ph.D. 1976, State University of New York at Stony Brook

Richard Catlin Haskett, *Professor of American History*
B.A. 1940, M.A. 1941, Indiana University at Bloomington; M.A. 1948, Ph.D. 1952, Princeton University

Gertrude Haugan, *Clinical Instructor in Art Therapy*
B.A. 1952, M.A. 1956, George Washington University; Ph.D. 1970, University of Maryland

Donald Hawkins, *Professor of Human Kinetics and Leisure Studies and Research Professor of Medicine*
B.A. 1950, King's College, Pennsylvania; M.A. 1960, Lehigh University; Ed.D. 1967, New York University

Charles Herbert Hayes, *Adjunct Instructor in Health Care Administration*
B.A. 1972, Chapman College; M.S. 1973, Naval Postgraduate School

Patrick Louis Hayes, *Assistant Professorial Lecturer in Mathematics*
B.S. 1970, M.S. 1971, D.A. 1973, Carnegie-Mellon University

Joseph Ernest Hazel, *Associate Professorial Lecturer in Geology*
B.A. 1956, M.A. 1960, University of Missouri; Ph.D. 1963, Louisiana State University and Agricultural and Mechanical College

Janet Craig Heddesheimer, *Associate Professor of Education*
B.A. 1965, Coe College; M.A. 1968, Ph.D. 1971, Ohio State University

Dorothy Henderson Heilman, *Professorial Lecturer in Microbiology (Cellular Immunology)*
B.S. 1927, M.D. 1932, Northwestern University; M.S. 1940, University of Minnesota

Dagmar Renate Kirshner Henney, *Associate Professor of Mathematics*
B.S. 1954, M.S. 1956, University of Miami; Ph.D. 1964, University of Maryland

John Helmer, *Associate Professor of Sociology*
B.A. 1966, University of Melbourne; M.A. 1969, Ph.D. 1972, Harvard University

Charles Joseph Herber, *Associate Professor of European History*
B.A. 1952, Dickinson College; M.A. 1957, Ph.D. 1965, University of California, Berkeley

Gilbert Richard Herer, *Professorial Lecturer in Speech and Professor of Child Health and Development*
B.S. 1949, M.S. 1954, Syracuse University; Ph.D. 1964, Northwestern University

Roy Hertz, *Research Professor of Pharmacology and of Obstetrics and Gynecology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

Susan Hertz, *Assistant Professorial Lecturer in Anthropology*
B.A. 1966, Stanford University; M.A. 1969, Ph.D. 1974, University of Minnesota

Julia Elizabeth Hicks, *Assistant Professor of Spanish*
B.A. 1946, M.A. 1947, University of Tennessee, Knoxville

Phillip Henry Highfill, Jr., *Professor of English*
B.A. 1942, Wake Forest University; M.A. 1948, Ph.D. 1950, University of North Carolina

Peter Proal Hill, *Professor of History*
B.A. 1949, Tufts University; M.A. 1954, Boston University; Ph.D. 1966, George Washington University

James William Hillis, *Professor of Speech; Director, Speech Pathology and Audiology*
B.S. 1952, University of Nebraska; M.A. 1957, University of Maryland; Ph.D. 1963, Ohio State University

Joseph Hilmy, *Professorial Lecturer in Accounting*
B.Com. 1947, M.S. 1954, Ph.D. 1959, University of Aberdeen

Alfred John Hiltebeitel, *Associate Professor of Religion*
B.A. 1963, Haverford College; M.A. 1966, Ph.D. 1973, University of Chicago

Harold Clendenin Hinton, *Professor of Political Science and International Affairs*
B.A. 1946, M.A. 1948, Ph.D. 1951, Harvard University

Harold Lester Hirsh, *Professorial Lecturer in Health Care Administration*
M.D. 1942, Georgetown University; J.D. 1972, American University

Denis Michael Hitchcock, *Assistant Professor of Art*
B.A. 1967, University of California, Los Angeles; M.F.A. 1970, Ph.D. 1977, Princeton University

Herman Hedberg Hobbs, *Professor of Physics*
B.S. 1953, M.S. 1955, George Washington University; Ph.D. 1958, University of Virginia

Robert Lee Holland, *Associate Professor of Management Science; Dean of the College of General Studies*
B.S. 1951, M.S. 1958, University of Tennessee, Knoxville; Ph.D. 1960, Texas A&M University

Bruce Holly, Jr., *Clinical Instructor in Art Therapy*
B.A. 1971, University of Notre Dame; M.A. 1975, George Washington University

Mary Alida Holman, *Professor of Economics*
B.A. 1955, M.A. 1957, Ph.D. 1963, George Washington University

Robert William Holmstrom, *Associate Professor of Psychology*
B.A. 1956, Trinity College, Connecticut; Ph.D. 1965, Duke University

William Duane Hope, *Adjunct Associate Professor of Biological Sciences*
B.S. 1957, M.S. 1960, Colorado State University; Ph.D. 1964, University of California, Davis

Grace Brewster Murray Hopper, *Professorial Lecturer in Management Science*
B.A. 1928, Vassar College; M.A. 1930, Ph.D. 1934, Yale University

Gloria Lyon Horrworth, *Associate Professor of Education*
B.A. 1952, California State University, Los Angeles; M.A. 1961, California State University, Northridge; Ed.D. 1972, American University

Paul Michael Horvitz, *Visiting Professor of Finance*
B.A. 1954, University of Chicago; M.B.A. 1956, Boston University; Ph.D. 1958, Massachusetts Institute of Technology

Sue Ann Robinson Hoth, *Research Instructor in Education*
B.A. 1968, University of New Hampshire; M.A. 1971, Columbia University

Nicholas Hotton, *Professorial Lecturer in Geology*
B.S. 1947, Ph.D. 1950, University of Chicago

Dee Ann Pletsch Houston, *Assistant Professorial Lecturer in Biological Sciences*
B.S. 1965, M.S. 1968, George Washington University

Lawrence Houstoun, Jr., *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1952, Lafayette College

Tao-tai Hsia, *Professorial Lecturer in Law*
LL.B. 1945, National Cheng-chi University, China; LL.M. 1950, J.S.D. 1952, Yale University

Ching-Yao Hsieh, *Professor of Economics*
B.A. 1939, St. John's University, China; M.A. 1958, Ph.D. 1964, George Washington University

Kun-yen Huang, *Associate Professor of Microbiology*
M.D. 1959, National Taiwan University; Ph.D. 1967, George Washington University

Houlder Howard Hudgins, Jr., *Assistant Professorial Lecturer in Art*
B.S. 1970, Virginia Commonwealth University

Terry Lee Hufford, *Associate Professor of Botany*
B.S. 1961, M.A. 1962, Bowling Green State University, Ph.D. 1972, Ohio State University

Rudolph Hugh, *Professor of Microbiology*
B.S. 1948, Michigan State University; Ph.D. 1954, Loyola University of Chicago

Thomas Louis Hughes, *Assistant Professorial Lecturer in Geology*
B.S. 1958, University of Oklahoma

Robert Lee Humphrey, Jr., *Associate Professor of Anthropology*
B.A. 1962, American University; Ph.D. 1970, University of New Mexico

Gérard Paul Huvé, *Assistant Professor of French*
B.A. 1963, American University; M.A. 1969, University of Maryland

James Francis Clark Hyde, Jr., *Professorial Lecturer in Political Science*
B.S. 1942, U.S. Military Academy; LL.B. 1949, University of Pennsylvania; M.A. in I.A. 1967, George Washington University

C. Terrence Ireland, *Associate Professor of Statistics*
B.A. 1960, Cornell University; Ph.D. 1967, George Washington University

Norman Murray Irvine, *Studio Lecturer in Applied Music (Bass)*
B.S. in Mus.Ed. 1955, M.Ed. in Mus.Ed. 1962, University of Maryland

Jean Baldini Isaacs, *Research Instructor in Human Kinetics and Leisure Studies*
B.A. 1966, Wheaton College

Rita Klein Ives, *Professor of Special Education*
B.S. 1953, University of Pittsburgh; M.A. in Ed. 1957, Ed.S. 1967, Ed.D. 1971, George Washington University

Michael John Jackson, *Associate Professor of Physiology and Associate Research Professor of Medicine*
B.S. 1963, University of London; Ph.D. 1966, Sheffield University

Cecil Bryant Jacobson, *Associate Professor of Obstetrics and Gynecology*
B.S. 1960, University of Utah; M.D. 1964, George Washington University

Dorothy Coy Jarvinen, *Studio Lecturer in Applied Music (Cello)*
Diploma 1939, Institute of Musical Art

Diana Entwisle Johnson, *Assistant Professor of Biology*
B.A. 1970, Cornell College; Ph.D. 1975, University of Chicago

Nancy Diers Johnson, *Assistant Professor of Human Kinetics and Leisure Studies*
B.S. 1955, University of Minnesota; M.A. 1966, University of Iowa

Thomas Nick Johnson, *Professor of Anatomy*
B.S. 1944, St. Ambrose College; M.S. 1949, Michigan State University; Ph.D. 1953, University of Michigan

William Arthur Johnson, *Research Professor of Economics*
B.A. 1958, Syracuse University; M.A. 1961, Ph.D. 1964, Harvard University

William Reid Johnson, *Associate Professor of History*
B.A. 1951, Oberlin College; M.A. 1955, Ph.D. 1961, University of Washington

Meredith Leam Jones, *Adjunct Professor of Biological Sciences*
B.A. 1948, M.A. 1952, Ph.D. 1956, University of California, Berkeley

Robert Gean Jones, *Professor of Religion; University Marshal*
B.A. 1947, Baylor University; B.D. 1950, M.A. 1957, Ph.D. 1959, Yale University

Eva Scheyer Jospe, *Associate Professorial Lecturer in Religion*
M.A. 1963, Georgetown University

*†**Hugo Dietrich Junghenn**, *Associate Professor of Mathematics*
B.S. 1964, Albright College; M.A. 1967, Villanova University; Ph.D. 1971, George Washington University

Robert Konrad Kahn, *Professorial Lecturer in Psychology*
B.A. 1946, University of Pennsylvania; M.A. 1953, George Washington University; Ph.D. 1957, Pennsylvania State University

Zsuzsanna Sylvia Karasz, *Lecturer in Chinese*
B.A. 1969, Wellesley College; M.A. 1971, Stanford University

†**Stephen Arnold Karp**, *Associate Professor of Psychology*
B.A. 1949, City University of New York, Brooklyn College; M.A. 1952, New School for Social Research; Ph.D. 1962, New York University

* On sabbatical leave spring semester 1978.
† On sabbatical leave fall semester 1977.

Kenneth Casper Kates, *Professorial Lecturer in Zoology*
B.A. 1932, Bard College; M.A. 1934, Ph.D. 1937, Duke University

Barbara Sylvia Katz, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. in P.E. 1952, City University of New York, Brooklyn College; M.A. in Ed. 1968, George Washington University

Irving Katz, *Professor of Mathematics*
B.S. 1956, City University of New York, Brooklyn College; M.A. 1958, Ohio State University; Ph.D. 1964, University of Maryland

Erle Galen Kauffman, *Adjunct Professor of Geology*
B.S. 1955, M.S. 1956, Ph.D. 1961, University of Michigan

Samuel Kavruck, *Visiting Professor of Education*
B.S. 1937, M.S. in Ed. 1939, City University of New York, City College; M.A. in Govt. 1968, Ed.D. 1954, George Washington University

Warren Keegan, *Professor of Business Administration*
B.A. 1958, M.A. 1959, Kansas State University; D.B.A. 1967, Harvard University

Steven Keller, *Assistant Professor of Speech; Director of Forensics*
B.S. 1968, M.A. 1969, Ohio State University

Jerry Kelley, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1963, George Williams College; M.A. 1970, Roosevelt University

Margaret Fraser Kelso, *Lecturer in Education*
B.A. 1968, M.A. 1974, George Washington University

John Whitefield Kendrick, *Professor of Economics*
B.A. 1937, M.A. 1939, University of North Carolina; Ph.D. 1955, George Washington University

*Robert Emmett Kennedy, Jr., *Associate Professor of European History*
B.A. 1963, Johns Hopkins University; M.A. 1965, Boston College; Ph.D. 1973, Brandeis University

Richard Alec Kenney, *Professor of Physiology*
B.S. 1945, Ph.D. 1947, University of Birmingham

Robert Wayne Kenny, *Professor of History*
B.J. 1953, University of Texas at Austin; M.A. 1957, University of Minnesota; Ph.D. 1967, University of Chicago

Stephen Gabriel Kent, *Associate Professor of Pathology*
B.A. 1956, M.D. 1960, Case Western Reserve University

Hewitt Kenyon, *Professor of Mathematics*
B.S. 1942, Ph.D. 1954, University of California, Berkeley

Jackson Kelley Kern, *Adjunct Assistant Professor of Statistics*
B.A. 1938, Fairmont State College; M.B.A. 1954, Columbia University

Margot Starr Kernan, *Visiting Assistant Professor of Speech*
B.A. 1948, Bennington College; M.A. 1966, San Francisco State University

James Michael Kerns, *Assistant Professor of Anatomy*
B.A. 1966, St. Olaf College; M.S. 1968, Ph.D. 1972, Purdue University

Norayr Krikor Khatcheressian, *Associate Professor of Physics*
B.A. 1960, M.A. 1963, George Washington University; Ph.D. 1966, University of Virginia

Sura Kang Kim, *Studio Lecturer in Applied Music (Piano)*
B.A. 1949, Ewha University, Korea; Mus.B. 1950, Baldwin-Wallace College; Mus.M. 1957, Manhattan School of Music

Young Kim, *Professor of Political Science and International Affairs*
M.A. 1956, Vanderbilt University; Ph.D. 1958, University of Pennsylvania

Phyllis Dawn Kind, *Associate Professor of Microbiology*
B.A. 1955, Montana State University; M.S. 1956, Ph.D. 1960, University of Michigan

†James Cecil King, *Professor of German*
B.A. 1949, M.A. 1950, Ph.D. 1954, George Washington University

* On sabbatical leave academic year 1977-78.
† On sabbatical leave spring semester 1978.

*Michael King, *Assistant Professor of Chemistry*
B.S. 1966, Illinois Institute of Technology; M.A. 1967, Ph.D. 1970, Harvard University

Arthur David Kirsch, *Professor of Statistics and of Psychology*
B.A. 1955, George Washington University; M.S. 1956, Ph.D. 1957, Purdue University

Peter Flindell Klarén, *Associate Professor of History*
B.A. 1960, Dartmouth College; M.A. 1964, Ph.D. 1968, University of California, Los Angeles

Devra Gail Kleiman, *Adjunct Associate Professor of Psychology*
B.S. 1964, University of Chicago; Ph.D. 1969, University of London

Philip Klubes, *Associate Professor of Pharmacology*
B.S. 1956, City University of New York, Queens College; M.S. 1959, Ph.D. 1962, University of Minnesota

Robert Earle Knowlton, *Associate Professor of Biology*
B.A. 1960, Bowdoin College; Ph.D. 1970, University of North Carolina

Marilyn Jean Koering, *Associate Professor of Anatomy*
B.A. 1960, College of St. Scholastica; M.S. 1963, Ph.D. 1967, University of Wisconsin

Jason David Kogan, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1966, Pennsylvania State University; J.D. 1969, George Washington University

Martin Jerome Kohn, *Associate Professorial Lecturer in Economics*
B.A. 1953, Oberlin College; M.A. 1957, Ph.D. 1970, Yale University

Louis Sampson Kornicker, *Adjunct Professor of Biological Sciences*
B.S. 1941, B.S. 1942, University of Alabama; M.A. 1954, Ph.D. 1957, Columbia University

Robert Henry Kraft, *Studio Lecturer in Applied Music (Trombone and Recorder)*
Mus.B. 1960, Eastman School of Music

Edith Kramer, *Assistant Professorial Lecturer in Art Therapy*

Joan Krash, *Assistant Professorial Lecturer in Art Therapy*
B.A. 1956, George Washington University; M.A. 1973, Ph.D. 1975, American University

Kenneth Krell, *Adjunct Assistant Professor of Genetics*
B.A. 1954, University of Pittsburgh; M.S. 1967, Ph.D. 1970, Columbia University

Melinda Kreshover, *Clinical Instructor in Art Therapy*
B.A. 1972, M.A. 1974, George Washington University

Dean Krueger, *Research Professor of Statistics and of Ophthalmology*
B.A. 1938, M.A. 1942, University of Chicago; M.S. 1959, Columbia University

Ruth Marilyn Krulfeld, *Professor of Anthropology*
B.A. 1956, Brandeis University; Ph.D. 1974, Yale University

Edwin Paul Kulawiec, *Associate Professor of Education*
B.S. 1950, Bethany College, West Virginia; M.A. 1956, Seton Hall University; M.A.T. 1961, Indiana University at Bloomington; Ph.D. 1971, University of Wisconsin

Maquette Kubey Kuper, *Studio Lecturer in Applied Music (Flute)*
B.M. 1971, New England Conservatory of Music

Frederick Charles Kurtz, *Associate Professor of Accounting*
B.S. in Com. 1948, University of Virginia; M.B.A. 1949, University of Pennsylvania; C.P.A. 1952, State of Maryland

Hanna Yaxa Landsberg Kwiatkowska, *Adjunct Assistant Professor of Art Therapy*
B.A. 1929, Academy of Fine Arts, Warsaw

Irene Kyriakopoulos, *Assistant Professorial Lecturer in Economics*
B.A. 1970, University of Maryland; M.A. 1972, George Washington University

Daniel Irving Labowitz, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1966, Syracuse University; J.D. 1969, Albany Law School; M.F.S. 1976, George Washington University

* On sabbatical leave fall semester 1977.

John Marion Lachin III, *Assistant Research Professor of Statistics*
B.S. 1965, Tulane University of Louisiana; Sc.D. 1972, University of Pittsburgh

Jerry Lee Lake, *Assistant Professor of Photography*
B.F.A. 1966, Virginia Commonwealth University; M.F.A. 1968, Ohio University

Joan Simon Landy, *Instructor in Special Education*
B.S. in Elem.Ed. 1968, Syracuse University; M.A. in Ed. 1969, George Washington University

Carl James Lange, *Associate Professor of Psychology; Vice President for Administration and Research*
B.S. 1945, Duke University; M.S. 1946, Ph.D. 1951, University of Pittsburgh

JoAnne Lanouette, *Lecturer in Anthropology*
B.S. 1967, University of Minnesota; M.A. 1976, George Washington University

Nicholas Lappas, *Assistant Professor of Forensic Sciences*
B.A. 1964, Thiel College; M.S. 1973, Ph.D. 1975, Duquesne University

Michael Launer, *Visiting Associate Professor of Russian*
B.A. 1965, Yale University; M.A. 1968, Ph.D. 1970, Princeton University

*Geza Peter Lauter, *Professor of Business Administration*
B.A. 1954, Institute for Foreign Languages, Hungary; B.A. 1962, M.B.A. 1964, Ph.D. 1966, University of California, Los Angeles

Robert Alan Lavine, *Associate Professor of Physiology*
B.S. 1962, Ph.D. 1969, University of Chicago

†Thelma Z. Lavine, *Elton Professor of Philosophy*
B.A. 1936, Radcliffe College; M.A. 1937, Ph.D. 1939, Harvard University

Edward Pitt Lawson, *Assistant Professorial Lecturer in Art*
B.A. 1951, Bowdoin College; M.A. 1955, New York University

Thomas Lawton, *Associate Professorial Lecturer in Chinese*
B.S. 1953, Durfee Technical Institute; M.F.A. 1959, University of Iowa; Ph.D. 1970, Harvard University

William Matthew Leach, *Adjunct Professor of Genetics*
B.A. 1956, Berea College; M.S. 1962, Ph.D. 1965, University of Tennessee, Knoxville

Hugh Linus LeBlanc, *Professor of Political Science and Public Affairs; Director, Programs in Public Affairs*
B.A. 1948, Louisiana State University and Agricultural and Mechanical College; M.A. 1950, University of Tennessee, Knoxville; Ph.D. 1958, University of Chicago

Davis Lin-chuan Lee, *Assistant Professor of Chinese*
B.S. 1955, Chung-Hsing University, Taiwan; M.S. 1959, University of Minnesota

Myrna Pike Lee, *Associate Professor of Mathematics*
B.A. 1957, Cornell University; M.S. 1959, Ph.D. 1962, University of Illinois

Donald Richard Lehman, *Associate Professor of Physics*
B.A. 1962, Rutgers University, New Brunswick; M.S. 1964, Air Force Institute of Technology; Ph.D. 1970, George Washington University

Maya Leibovic, *Assistant Professorial Lecturer in Hebrew*
B.A. 1972, Tel Aviv University

Patricia Hilary Madoo Lengermann, *Professor of Sociology*
B.A. 1963, Oxford University; M.A. 1966, Ph.D. 1969, Cornell University

Fred Charles Leone, *Professorial Lecturer in Statistics*
B.A. 1942, Manhattan College; M.S. 1943, Georgetown University; Ph.D. 1949, Purdue University

Edwin Milton Lerner II, *Research Professor of Microbiology*
B.A. 1941, M.D. 1944, Harvard University

Sar Levitan, *Professor of Economics*
B.S.S. 1937, City University of New York, City College; M.A. 1939, Ph.D. 1949, Columbia University

Bernard Isaac Levy, *Professor of Psychology*
B.A. 1948, New York University; Ph.D. 1952, University of Rochester

* On sabbatical leave fall semester 1977
† On sabbatical leave academic year 1977-78

Joseph Benjamin Levy, *Professor of Chemistry*
B.S. 1943, University of New Hampshire; M.S. 1945, Ph.D. 1948, Harvard University

Edwin Joseph Baughman Lewis, *Professor of Accounting*
B.A. 1938, University of Western Ontario; M.B.A. 1939, Northwestern University

John Frederick Lewis, *Associate Professor of Geology*
B.S. 1959, M.S. 1960, Victoria University of Wellington, New Zealand; D.Phil. 1964, Oxford University

Ralph Kepler Lewis, *Professor of Anthropology*
B.A. 1934, Southwest Missouri State College; M.A. 1939, University of Southern California; Ph.D. 1967, Columbia University

*Hubert Whitman Lilliefors, *Professor of Statistics*
B.A. 1952, Ph.D. 1964, George Washington University; M.A. 1953, Michigan State University

Carl Arne Linden, *Associate Professor of International Affairs and Political Science*
B.A. 1951, Syracuse University; M.A. 1956, Harvard University; Ph.D. 1966, George Washington University

Roy Charles Lindholm, *Associate Professor of Geology*
B.S. 1959, University of Michigan; M.A. 1963, University of Texas at Austin; Ph.D. 1967, Johns Hopkins University

Craig William Linebaugh, *Assistant Professor of Speech*
B.A. 1970, Lebanon Valley College; M.A. 1974, Ph.D. 1975, Temple University

Donald Linkowski, *Associate Professor of Education*
B.A. 1961, M.S. 1963, Ph.D. 1969, State University of New York at Buffalo

Calvin Darlington Linton, *Professor of English; Dean of Columbian College of Arts and Sciences*
B.A. 1935, George Washington University; M.A. 1939, Ph.D. 1940, Johns Hopkins University

Lewis Lipnick, *Studio Lecturer in Applied Music (Bassoon and Recorder)*
Mus.B. 1968, Peabody Institute of Baltimore

Gordon Leslie Lippitt, *Professor of Behavioral Sciences*
B.S. 1942, Litt.D. 1971, Springfield College; B.D. 1946, Yale University; M.A. 1947, University of Nebraska; Ph.D. 1959, American University

Sara Jane Little, *Assistant Professor of Special Education*
B.A. 1967, Austin College; M.A. 1968, Ed.D. 1970, University of Maryland

Thomas Phillip George Liverman, *Professor of Mathematics*
B.A. 1941, University of Montpellier; M.A. 1948, Ph.D. 1956, University of Pennsylvania

John Lobuts, Jr., *Adjunct Associate Professor of Management Science; Assistant Dean of the School of Government and Business Administration*
B.S. 1957, Fairmont State College; M.A. in Ed. 1965, Ed.D. 1970, George Washington University

Marilyn Rosenthal Loeb, *Assistant Research Professor of Microbiology*
B.A. 1951, Barnard College; M.A. 1955, Bryn Mawr College; Ph.D. 1958, University of Pennsylvania

Norma Maine Loeser, *Professor of Business Administration*
B.A. 1958, M.B.A. 1967, D.B.A. 1971, George Washington University

Gregory Anthony Lofaro, *Assistant Research Professor of Education*
B.A. 1968, Canisius College; M.S. 1970, Ph.D. 1976, State University of New York at Buffalo

John Mortimer Logsdon, *Associate Professor of Public Affairs and Political Science*
B.S. 1960, Xavier University, Ohio; Ph.D. 1970, New York University

David Peter Lohmann, *Assistant Professorial Lecturer in Business Administration*
B.S. 1963, U.S. Air Force Academy; M.S. 1964, Stanford University; D.B.A. 1973, Arizona State University

*On sabbatical leave academic year 1977-78

William Francis Edward Long, *Associate Professor of Economics; Dean of the Summer Sessions*
B.A. 1946, M.A. 1947, Ph.D. 1967, George Washington University

Benjamin David Lourie, *Assistant Professorial Lecturer in Art*
B.A. 1971, Earlham College

John Carl Lowe, *Associate Professor of Geography and Regional Science*
B.A. 1958, M.A. 1960, George Washington University; Ph.D. 1969, Clark University

Gregory Ludlow, *Associate Professor of French*
Licence ès Lettres 1962, University of Paris; Ph.D. 1970, McGill University, Canada

Carl David Lytle, *Adjunct Professor of Genetics*
B.S. 1963, Kent State University; M.S. 1965, Cornell University; Ph.D. 1968, Pennsylvania State University

Scott Douglas MacDonald, *Associate Professorial Lecturer in Urban and Regional Planning*
B.A. 1970, Indiana University at Bloomington, M.R.P. 1972, University of North Carolina

William Allan MacDonald, *Professor of Art and of Archeology*
B.A. 1940, Oberlin College, M.A. 1942, Ph.D. 1943, Johns Hopkins University

George Calvin Mackenzie, *Assistant Professor of Political Science*
B.A. 1967, Bowdoin College; M.A. 1970, Tufts University, Ph.D. 1975, Harvard University

Caroline Lebo MacMullan, *Lecturer in English*
B.A. 1962, University of Washington

James Hunt Maddox, *Associate Professor of English*
B.A. 1965, Princeton University; M.A. 1967, Ph.D. 1969, Yale University

John Francis Magnotti, Jr., *Associate Professorial Lecturer in Public Administration*
B.S. 1949, U.S. Military Academy; M.A. 1966, University of Maryland; Ph.D. 1973, American University

Theodore Maher, *Associate Professorial Lecturer in Public Administration*
B.A. 1962, Tufts University; M.A. 1967, Ph.D. 1970, University of Maryland

James Mahoney, Jr., *Associate Professorial Lecturer in Anthropology and American Civilization*
B.F.A. 1958, Philadelphia College of Art

Wendy Maiorana, *Lecturer in Art Therapy*
B.A. 1961, American University; M.A. 1976, George Washington University

Harald Malmgren, *Professor of Business and Public Administration*
B.A. 1957, Yale University; D.Phil. 1961, Oxford University

William Everett Maloney, *Associate Professorial Lecturer in Geology*
B.S. 1950, M.S. 1951, George Washington University

Harold George Mandel, *Professor of Pharmacology*
B.S. 1944, Ph.D. 1949, Yale University

Wallace Harper Mann, *Studio Lecturer in Applied Music (Flute)*
Mus.B. 1943, Eastman School of Music

Raymond Manning, *Adjunct Professor of Biological Sciences*
B.A. 1956, M.S. 1959, Ph.D. 1963, University of Miami

Nathan Mantel, *Research Professor of Statistics*
B.S. 1939, City University of New York, City College; M.A. 1956, American University

Joseph Bernard Margolin, *Adjunct Professor of Psychology*
B.A. 1942, City University of New York, Brooklyn College; M.A. 1947, George Washington University; Ph.D. 1954, New York University

Anthony Marinaccio, *Professor of Education*
Ed.B. 1937, Central Connecticut State College; M.A. 1939, Ohio State University; Ph.D. 1949, Yale University; LL.D. 1961, Parsons College

John Sawyer Martin, Jr., *Studio Lecturer in Applied Music (Cello)*

Shelley Ellen Smith Mastran, *Lecturer in Geography and Regional Science*
B.A. 1965, Vassar College; M.A. 1974, George Washington University

Anthony James Mastro, *Professor of Accounting*
B.S. 1951, M.B.A. 1953, New York University; M.A. 1963, University of Notre Dame; C.P.A. 1955, State of New Jersey

Otto Mayr, *Professorial Lecturer in History*
M.S. 1964, University of Rochester; Dr.Rer.Nat. 1968, Technische Hochschule, Germany

Paul Mazel, *Professor of Pharmacology and of Anesthesiology*
B.S. 1946, Medical College of Virginia of Virginia Commonwealth University; M.S. 1955, Trinity University; Ph.D. 1960, Vanderbilt University

Onofrio Louis Mazzatenta, *Associate Professorial Lecturer in Journalism*
B.A. 1960, Kent State University; M.S. 1963, Northwestern University

Guido Ettore Mazzeo, *Professor of Romance Languages*
B.A. 1936, City University of New York, City College; M.A. 1938, Ph.D. 1961, Columbia University

David McAleavey, *Assistant Professor of English*
B.A. 1966, M.F.A. 1972, Ph.D. 1974, Cornell University

John Francis McCarthy, Jr., *Associate Professor of Business Administration*
B.A. 1936, Duquesne University; M.I. 1955, University of Pittsburgh

Muriel Hope McClanahan, *Associate Professor of English*
B.A. 1935, Colorado College; M.A. 1937, Ph.D. 1940, University of Pittsburgh

William Agnew McClelland, *Professorial Lecturer in Psychology*
B.A. 1941, Brown University; M.A. 1946, Ph.D. 1948, University of Minnesota

Cynthia McClintock, *Assistant Professor of Political Science*
B.A. 1967, Harvard University; M.A. 1968, University of California, Los Angeles; Ph.D. 1976, Massachusetts Institute of Technology

Kenneth Frederick McClure, *Professorial Lecturer in Commercial Law*
B.S. 1931, M.S. 1932, Wichita State University; LL.B. 1941, University of Maryland

James Kenneth McDonald, *Associate Professor of International Affairs*
B.A. 1954, Yale University; B.Litt. 1961, D.Phil. 1975, Oxford University

Neil McDonald, *Associate Professorial Lecturer in Health Care Administration*
B.S. 1948, Duke University; M.H.A. 1966, Baylor University; D.P.A. 1971, George Washington University

John Patrick McGill, *Associate Professorial Lecturer in Journalism*
B.S. 1967, Georgetown University

Dorn Charles McGrath, Jr., *Professor of Urban Planning*
B.A. 1952, Dartmouth College; M.C.P. 1959, Harvard University

Gerald Joseph McHugh, *Assistant Professor of Health Care Administration*
B.Gen. Ed. 1962, University of Nebraska at Omaha; M.B.A. 1967, D.B.A. 1973, George Washington University

Margaret McIntyre, *Professor of Education*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1944, Northwestern University; A.P.C. 1965, George Washington University

Ruth Blumenfeld McKay, *Research Professor of Anthropology*
B.A. 1954, City University of New York, Brooklyn College; M.A. 1961, Ph.D. 1965, University of Pennsylvania

Cornelius Patrick McKelvey, *Instructor in Health Care Administration*
B.S. 1963, Philadelphia College of Pharmacy and Science; M.S. 1970, University of Maryland; M.A. in H.C.A. 1973, George Washington University

John Johnson McMillan, *Associate Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1943, Wake Forest University; M.A. 1948, Ph.D. 1951, Duke University

Marian McNabb, *Studio Lecturer in Applied Music (Piano and Organ)*
Mus.B. 1930, University of Kansas; M.S. in Mus. 1949, Union Theological Seminary

Robert Emit McNelis, *Assistant Professorial Lecturer in Education*
B.S. 1954, West Chester State College; M.A. in Ed. 1961, Ed.D. 1968, George Washington University

Cornelius Glen McWright, *Adjunct Professor of Forensic Sciences and of Biological Sciences*
B.A. 1952, University of Evansville; M.S. 1965, Ph.D. 1970, George Washington University

Kenneth Everett Melson, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1970, Denison University; J.D. 1973, George Washington University

*Malcolm Lee Meltzer, *Professor of Psychology*
B.A. 1951, Western Maryland College; M.A. 1954, Ph.D. 1957, Catholic University of America

Henry Merchant, *Associate Professor of Biology*
B.S. 1964, M.S. 1966, University of Maryland; Ph.D. 1970, Rutgers University, New Brunswick

Bernard Matthew Mergen, *Associate Professor of American Civilization*
B.A. 1959, University of Nevada, Reno; M.A. 1960, Ph.D. 1968, University of Pennsylvania

William Merrick, *Adjunct Associate Professor of Genetics*
B.S. 1965, Yale University; M.S. 1969, Ph.D. 1971, University of Georgia

Carl Ronald Merril, *Professorial Lecturer in Biochemistry*
B.S. 1958, College of William and Mary; M.D. 1962, Georgetown University

Anthony Louis Mescher, *Assistant Professor of Biology*
B.S. 1971, St. Joseph's College, Indiana; M.S. 1973, Ph.D. 1975, Ohio State University

Joseph Louis Métivier, Jr., *Professor of Romance Languages; Assistant Dean of Columbian College of Arts and Sciences*
B.A. 1951, M.A. 1955, George Washington University

Jack William Millar, *Vivian Gill Professor of Epidemiology and Environmental Health*
B.A. 1945, Stanford University; M.D. 1947, George Washington University; M.P.H. 1951, M.S. in Hygiene and Tropical Medicine 1952, Harvard University

Charles Russell Miller, *Associate Professor of Business Administration; George Washington University Program (Tidewater Area Center), Hampton, Va.*
B.S. 1945, U.S. Naval Academy; M.B.A. 1957, Ph.D. 1966, University of California, Los Angeles

Charles Walter Miller, *Instructor in Business Administration*
B.B.A. 1971, Kent State University; M.B.A. 1973, George Washington University

Elmer Thomas Miller, *Assistant Professorial Lecturer in Geology*
B.S. 1938, University of Richmond

Frank Nelson Miller, Jr., *Professor of Pathology*
B.S. 1943, M.D. 1948, George Washington University

James Miller, *Professor of Psychology; Director of Graduate Training in Clinical Psychology*
B.A. 1958, J.D. 1962, Ph.D. 1966, Yale University

Lillian Miller, *Special Lecturer in Art and American Civilization*
B.A. 1943, Radcliffe College; M.A. 1948, Ph.D. 1962, Columbia University

Mary Fetler Miller, *Adjunct Assistant Professor of Russian*
B.A. 1943, Northwestern University; M.A. 1966, University of Michigan

Dorothee Friedlander Mindlin, *Clinical Instructor in Art Therapy*
B.A. 1942, M.A. 1943, University of Chicago; Ph.D. 1965, American University

John Minna, *Adjunct Professor of Genetics*
B.A. 1963, M.D. 1967, Stanford University

Samuel Burdick Molina, *Assistant Professorial Lecturer in Art*
B.A. 1964, M.A. 1969, University of Wyoming

†Clarence Cowan Mondale, *Professor of American Civilization*
B.A. 1947, Macalester College; M.A. 1954, Ph.D. 1960, University of Minnesota

Karen Montgomery, *Lecturer in Art*
B.S. 1957, University of Maryland

* On leave academic year 1977-78
† On sabbatical leave academic year 1977-78

Dorothy Adele Moore, *Associate Professor of Education*
B.A. 1951, University of Maryland; M.A. 1959, A.P.C. 1964, Ed.D. 1970, American University

Robert Hamilton Moore, *Professor of English*
B.A. 1934, M.A. 1936, Indiana University at Bloomington; Ph.D. 1948, University of Illinois

John Andrew Morgan, Jr., *Professor of Political Science and Public Affairs*
B.A. 1957, Stetson University; M.A. 1959, Ph.D. 1963, Duke University

John Morrell, Jr., *Lecturer in Art*
B.S. 1973, Georgetown University

Glenn Ellis Morris, *Associate Professorial Lecturer in Psychiatry and Behavioral Sciences (Allied Health) and in Health Care Administration*
B.S. 1933, M.A. 1939, University of Illinois; M.S. in H.A. 1956, Northwestern University

Mabel Elizabeth Inco Morris, *Associate Professorial Lecturer in Mathematics*
B.A. 1923, University of Evansville; M.A. 1928, University of Chicago

Margaret Morrison, *Lecturer in English*
B.A. 1969, M.A. 1972, George Washington University

James Norman Mosél, *Professor of Psychology*
B.A. 1940, Colgate University; M.A. 1941, Columbia University

***Charles Arthur Moser**, *Professor of Russian*
B.A. 1956, Yale University; M.A. 1958, Ph.D. 1962, Columbia University

Robert Phillip Multhauf, *Adjunct Professor of History*
B.S. 1941, Iowa State University of Science and Technology; M.A. 1950, Ph.D. 1953, University of California, Berkeley

Joseph Patrick Murphy, *Professorial Lecturer in Business Administration*
B.A. 1949, LL.B. 1950, LL.M. 1952, George Washington University

Philip Anthony Musgrove, *Associate Professorial Lecturer in Economics*
B.A. 1962, Haverford College; M.P.A. 1964, Princeton University; Ph.D. 1974, Massachusetts Institute of Technology

Leonard Nadler, *Professor of Education*
B.B.A. 1948, M.S. 1950, City University of New York City College; Ed.D. 1962, Columbia University

Honey Nashman, *Assistant Professor of Human Kinetics and Leisure Studies; Director of the Office of Laboratory Experience, School of Education*
B.S. 1956, New York University; M.S. 1957, Smith College

Nadine Nadeshda Natov, *Associate Professor of Russian*
M.A. 1939, Ph.D. 1941, Pedagogical Institute of Modern Languages, Soviet Union; Ph.D. 1969, University of Michigan

Henry Richard Nau, *Associate Professor of Political Science and International Affairs*
B.S. 1963, Massachusetts Institute of Technology; M.A. 1967, Ph.D. 1972, Johns Hopkins University

Salih Nur Neftci, *Assistant Professor of Economics*
B.A. 1970, Middle East Technical University, Turkey; Ph.D. 1976, University of Minnesota

Anna Louise Kasten Nelson, *Associate Professorial Lecturer in History*
B.A. 1954, M.A. 1956, University of Oklahoma; Ph.D. 1972, George Washington University

†**David Nelson**, *Professor of Mathematics*
B.A. 1939, M.A. 1940, Ph.D. 1946, University of Wisconsin

Bjorn Karsten Netland, *Instructor in German; Assistant Dean of the Division of University Students*
B.A. 1971, M.A. 1973, George Washington University

Donald Lee Neugebauer, *Lecturer in Biological Sciences*
B.A. 1953, M.A. 1955, University of South Dakota

* On sabbatical leave fall semester 1977
† On sabbatical leave academic year 1977-78

Benjamin Nimer, *Professor of Political Science and International Affairs*
B.A. 1942, Ph.D. 1953, University of Chicago

James Noel, *Director of the George Washington University Program (Tidewater Area Center), Fort Monroe, Va., and Adjunct Assistant Professor of Education*
B.A. 1966, M.A. 1968, Central Michigan University; Ed.D 1972, North Carolina State University

Robert Anthony Norris, *Studio Lecturer in Applied Music (Guitar)*

Mary Elizabeth Norton, *Associate Professorial Lecturer in Classics*
B.A. 1935, M.A. 1938, University of Michigan

Ylda Farkas Novik, *Studio Lecturer in Applied Music (Piano)*
Mus.B. 1943, Cleveland Institute of Music

John Warren Nystrom, *Professorial Lecturer in Geography and Regional Science*
B.A. 1936, M.A. 1937, Ph.D. 1942, Clark University

Steve O'Brien, *Adjunct Professor of Genetics*
B.S. 1966, St. Francis College; Ph.D. 1971, Cornell University

Thomas O'Connor, *Professorial Lecturer in Management Science*
B.S. 1947, U.S. Naval Academy; M.B.A. 1956, Harvard University; Ph.D. 1965, Stanford University

*George Andrew Olkhovsky, *Associate Professor of Russian*
B.A. 1956, M.A. 1957, University of Minnesota; Ph.D. 1968, Georgetown University

Charles O'Rear, *Professor of Forensic Sciences*
B.S. 1957, Virginia Polytechnic Institute and State University; M.S. 1961, University of Richmond; Ph.D. 1970, Medical College of Virginia of Virginia Commonwealth University

Ruth Helm Osborn, *Associate Professorial Lecturer in Women's Studies; Assistant Dean for Continuing Education for Women of the College of General Studies*
B.S. 1940, University of Minnesota; M.A. in Ed. 1946, Ed.D. 1963, George Washington University

Türker Ozdogan, *Assistant Professor of Ceramics*
Diploma 1967, School of Applied Fine Arts, Turkey; M.F.A. 1972, George Washington University

Randall Kent Packer, *Associate Professor of Biology*
B.S. 1967, Lock Haven State College; Ph.D. 1971, Pennsylvania State University

Harry Robert Page, *Professor of Business Administration; Associate Dean for Academic Affairs of the School of Government and Business Administration*
B.A. 1941, Michigan State University; M.B.A. 1950, Harvard University; Ph.D. 1966, American University

Chei-Min Paik, *Associate Professor of Accounting and Quantitative Methods*
B.B.A. 1957, University of Minnesota; M.B.A. 1959, University of California, Los Angeles; D.B.A. 1963, Harvard University

Howard Erwin Paine, *Professorial Lecturer in Journalism*
B.A. 1950, American International College

Vincent Paul Parady, *Assistant Professor of Drama*
B.A. 1958, University of Maine at Orono; M.F.A. 1966, Catholic University of America

Salvatore Rocco Paratore, *Associate Professor of Education; Assistant Dean of the Summer Sessions*
B.A. 1957, Colgate University; M.S. 1967, Yeshiva University; Ph.D. 1973, Syracuse University

David Charles Park, *Research Instructor in Human Kinetics and Leisure Studies*
B.A. 1963, University of Kentucky; M.S. 1967, University of North Carolina

* On sabbatical leave spring semester 1976.

William Carleton Parke, *Associate Professor of Physics*
B.S. 1963, Ph.D. 1967, George Washington University

William Axel Parker, *Associate Professorial Lecturer in Health Care Administration*
B.S. 1945, University of Illinois; M.P.H. 1950, University of California, Berkeley; M.B.A. 1962, George Washington University

Richard Parnas, *Studio Lecturer in Applied Music (Violin and Viola)*

Robert Parris, *Professor of Music*
B.S. in Mus.Ed. 1945, M.S. in Mus.Ed. 1946, University of Pennsylvania; B.S. in Mus.Comp 1948, Juilliard School of Music

William Carroll Parrish, *Adjunct Instructor in Health Care Administration*
B.A. 1968, M.S. in Pers. Adm. 1967, George Washington University

*Gail Paster, *Assistant Professor of English*
B.A. 1961, Occidental College; M.S. 1969, Ph.D. 1970, Tulane University of Louisiana

Donald Clark Paup, *Adjunct Associate Professor of Human Kinetics and Leisure Studies*
B.A. 1961, Occidental College; M.S. 1969, Ph.D. 1970, Tulane University of Louisiana

David Leo Pawson, *Adjunct Associate Professor of Biological Sciences*
B.S. 1960, M.S. 1961, Ph.D. 1964, Victoria University, New Zealand

Richard Alan Payton, *Adjunct Instructor in Health Care Administration*
B.A. 1962, University of Iowa; M.S. 1971, Naval Postgraduate School

†Eldor Olin Pederson, *Associate Professor of Geography and Regional Science*
B.A. 1966, University of Washington; C.Ph. 1969, Ph.D. 1974, University of California, Berkeley

Lynn Sullivan Pena, *Adjunct Assistant Professor of English*
B.A. 1974, Brown University; M.S. 1975, Georgetown University

Thomas Paul Perazzoli, *Studio Lecturer in Applied Music (Flute)*

Malinee Peris, *Studio Lecturer in Applied Music (Piano)*
Licentiate 1946, 1947, Trinity College of Music, England; Licentiate 1950, Royal Academy of Music, England

Theodore Peter Perros, *Professor of Chemistry and of Forensic Sciences*
B.S. 1946, M.S. 1949, Ph.D. 1952, George Washington University

Ruth Irene Peterson, *Associate Professor of Education*
B.S. 1945, State University of New York at Buffalo; M.S. 1946, Syracuse University; Ph.D. 1971, American University

John Charles Petricciani, *Adjunct Professor of Genetics*
B.S. 1958, Rensselaer Polytechnic Institute; M.S. 1960, University of Nevada, Reno; M.D. 1967, Stanford University

Vladimir Petrov, *Professor of International Affairs*
M.A. 1931, Ph.D. 1935, Yale University

Carl Herman Pfuntner, *Associate Professor of Philosophy*
B.A. 1949, M.A. 1953, George Washington University; Ph.D. 1967, Georgetown University

Marianne Ruth Phelps, *Assistant Professorial Lecturer in Education; Assistant Provost for Affirmative Action*
B.A. 1961, University of Michigan; M.S. 1964, M.A. 1965, University of Wisconsin; M.Phil 1973, George Washington University

‡Ewing Lakin Phillips, *Professor of Psychology; Director, Counseling Center*
B.S. 1937, Central Missouri State College; M.A. 1940, University of Missouri; Ph.D. 1949, University of Minnesota

Jerome Pickard, *Professorial Lecturer in Geography and Regional Science*
B.A. 1947, M.S. 1949, University of Wisconsin; Ph.D. 1954, Syracuse University

* On leave of absence fall semester 1977.
† On sabbatical leave academic year 1977-78
‡ On sabbatical leave spring semester 1978.

Jack Warren Pierce, *Adjunct Professor of Geology*
B.S. 1949, M.S. 1950, University of Illinois; Ph.D. 1964, University of Kansas

Mordechai Pinkasovic, *Assistant Professorial Lecturer in Hebrew*
Licence 1971, Diplome d'Etudes Superieures 1972, University of Grenoble, France

Judith Ann Abrams Plotz, *Associate Professor of English*
B.A. 1960, Radcliffe College; B.A. 1962, M.A. 1966, Cambridge University; Ph.D. 1965, Harvard University

Herman Pollack, *Research Professor of International Affairs*
B.S. 1940, City University of New York, City College; M.A.I.A. 1966, George Washington University

Paul John Poppen, *Assistant Professor of Psychology*
B.A. 1969, Central University of Iowa; Ph.D. 1973, Cornell University

Joseph Raymond Potter, Jr., *Associate Professorial Lecturer in Business Administration*
B.S. 1954, University of Maryland; M.B.A. 1963, Case Western Reserve University

Georgette Ernestine Powell, *Clinical Instructor in Art Therapy*
B.F.A. 1973, Howard University

Francisco Prats, *Professor of Physics*
Licenciado en Ciencias Fisico 1946, University of Madrid; Ph.D. 1958, University of Maryland

Stephen Henry Prussing, *Studio Lecturer in Applied Music (Voice); Director of Choral Groups*
B.A. 1945, Occidental College. Postgraduate Diploma 1948, Juilliard School of Music

Charles William Puffenbarger, *Professorial Lecturer in Journalism*
B.S. 1951, University of Maryland; M.A. 1964, George Washington University

Ralph Elliott Purcell, *Professor of Political Science*
B.A. 1940, Florida Southern College; M.A. 1941, Duke University; Ph.D. 1949, University of Wisconsin

Jon Alrik Quitslund, *Associate Professor of English*
B.A. 1961, Reed College; Ph.D. 1967, Princeton University

Sonya Antoinette Quitslund, *Assistant Professor of Religion*
B.A. 1958, Seattle University; M.A. 1964, Ph.D. 1967, Catholic University of America

Ara Thomas Rachal, *Assistant Professorial Lecturer in Music*
B.S. 1970, Xavier University; B.M.T. 1970, Loyola University

Roland Cloyd Raffaelle, *Studio Lecturer in Applied Music (Guitar)*

David Ramaker, *Assistant Professor of Chemistry*
B.S. 1965, University of Wisconsin—Milwaukee; M.S. 1968, Ph.D. 1971, University of Iowa

Margaret Mary Hupp Ramsay, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1957, Purdue University; M.S. 1958, University of Wisconsin

Samuel Edward Ramsay, *Studio Lecturer in Applied Music (French Horn)*

Bernard Ramundo, *Professorial Lecturer in Law*
B.A. 1947, City University of New York, City College; LL.B. 1949, M.A. 1957, Columbia University; Ph.D. 1966, American University

Martha Norman Rashid, *Professor of Education*
Ed.B. 1949, State University of New York, College at Geneseo; M.A. 1951, Ph.D. 1955, University of Iowa

George Walter Recker, *Studio Lecturer in Applied Music (Trumpet)*

Charles Reeder, *Assistant Research Professor of Education*
B.A. 1968, California State University at San Diego; M.A. 1970, Michigan State University; Ph.D. 1974, University of Missouri

John Palmer Reesing, Jr., *Professor of English*
B.A. 1941, Baylor University; M.A. 1942, Tulane University; Ph.D. 1954, Harvard University

Philip Norman Reeves, *Associate Professor of Health Care Administration*
M.B.A. 1959, University of Chicago; D.B.A. 1970, George Washington University

Mary O'Connell Regan, *Assistant Professorial Lecturer in Speech*
B.A. 1961, College of New Rochelle; M.A. 1964, Columbia University; Ph.D. 1970, New York University

Joan Roddy Regnell, *Assistant Professor of Speech*
B.A. 1954, M.A. 1960, George Washington University

Harald Alfred Rehder, *Adjunct Professor of Biological Sciences*
B.A. 1929, Bowdoin College; M.A. 1933, Harvard University; Ph.D. 1934, George Washington University

Bernard Reich, *Professor of Political Science and International Affairs*
B.A. 1961, City University of New York, City College; M.A. 1963, Ph.D. 1964, University of Virginia

Melvin Reich, *Associate Professor of Microbiology*
B.S. 1953, City University of New York, City College; M.S. 1957, Ph.D. 1960, Rutgers University, New Brunswick

Frances Catherine Reid, *Adjunct Assistant Professor of English*
B.A. 1965, College of Notre Dame of Maryland; M.S. 1970, Georgetown University

Elaine Reuben, *Visiting Associate Professor of Women's Studies*
B.A. 1963, Brandeis University; M.A. 1966, Ph.D. 1970, Stanford University

William Martin Reynolds, *Professor of Speech*
B.A. 1950, Wichita State University; M.A. 1957, Ph.D. 1960, University of Florida

Raymond Patrick Rhinehart, *Assistant Professorial Lecturer in English*
B.A. 1962, Brown University; M.A. 1964, Ph.D. 1969, Princeton University

Leo Paul Ribuffo, *Assistant Professor of History*
B.A. 1966, Rutgers University, New Brunswick; M.Phil. 1969, Ph.D. 1976, Yale University

Bart Francis Rice, *Assistant Professorial Lecturer in Mathematics*
B.A. 1965, Rice University; M.S. 1967, Ph.D. 1969, Louisiana State University; M.S. 1976, Johns Hopkins University

Charles Edward Rice, *Professor of Psychology*
B.S. 1954, Iowa State University of Science and Technology; Ph.D. 1959, Case Western Reserve University

Mary Rice, *Adjunct Associate Professor of Biological Sciences*
B.A. 1947, Drew University; M.A. 1949, Oberlin College; Ph.D. 1966, University of Washington

William Lawrence Roach, Jr., *Adjunct Instructor in Health Care Administration*
B.S. 1970, Virginia Polytechnic Institute and State University; M.H.A. 1972, Medical College of Virginia of Virginia Commonwealth University

*James Willis Robb, *Professor of Romance Languages*
B.A. 1939, Colgate University; M.A. 1950, Middlebury College; Ph.D. 1958, Catholic University of America

Mary Louise Robbins, *Professor of Microbiology*
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University

Philip Robbins, *Associate Professor of Journalism*
B.A. 1952, Washington and Lee University; M.S. 1955, Columbia University

Donald Robinson, *Adjunct Professor of Political Science*
B.A. 1958, M.A. 1959, Northwestern University; Ph.D. 1963, American University

Lilien Filipovitch Robinson, *Associate Professor of Art*
B.A. 1962, M.A. 1965, George Washington University

Elie Rogers, *Associate Professorial Lecturer in Journalism*
B.A. 1955, University of Colorado

Daniel David Roman, *Professor of Management Science*
B.S. in B.A. 1949, M.A. 1953, Ph.D. 1956, University of Southern California

Clyde Forrest Roper, *Adjunct Associate Professor of Biological Sciences*
B.S. 1959, Transylvania University; M.S. 1962, Ph.D. 1967, University of Miami

Colin Campbell Rorrie, Jr., *Associate Professorial Lecturer in Health Care Administration*
B.A. 1964, Beloit College; M.A. 1966, Ph.D. 1968, University of Iowa

*On sabbatical leave fall semester 1977.

Carolyn Rusch Rose, *Lecturer in Art and Anthropology*
B.A. 1971, Sweet Briar College

Joseph Rosewater, *Adjunct Associate Professor of Biological Sciences*
B.S. 1950, M.S. 1956, University of New Hampshire; Ph.D. 1960, Harvard University

Lawrence Allen Rothblat, *Associate Professor of Psychology
B.A. 1964, M.A. 1967, Ph.D. 1968, University of Connecticut

Walter Frederick Rowe, *Assistant Professor of Forensic Sciences*
B.S. 1967, Emory University; M.A. 1968, Ph.D. 1975, Harvard University

William Woodin Rowe, *Associate Professor of Russian*
B.A. 1956, Harvard University; Ph.D. 1968, New York University

†David Alton Rowley, *Associate Professor of Chemistry; Assistant Dean of the Graduate School of Arts and Sciences*
B.S. 1963, M.S. 1964, State University of New York at Albany; Ph.D. 1968, University of Illinois

Constance Adelaide Russell, *Studio Lecturer in Applied Music (Piano)*
Artist Diploma 1938, Curtis Institute of Music; Artist Diploma and Teacher's Certificate 1936, American Conservatory at Fontainbleau

William Rutiser, *Assistant Professorial Lecturer in Statistics*
B.S. (Machine Computers) 1967, George Washington University

Robert Clinton Rutledge, *Associate Professor of English; Assistant Dean of Columbian College of Arts and Sciences*
B.A. 1940, University of Virginia, M.A. 1957, Ph.D. 1966, George Washington University

Bradley William Sabelli, *Assistant Professor of Speech and Drama*
B.F.A. 1970, Florida Atlantic University; M.A. 1972, California State University, Humboldt; M.F.A. 1974, George Washington University

Howard Morley Sachar, *Professor of History*
B.A. 1947, Swarthmore College; M.A. 1950, Ph.D. 1953, Harvard University

James Minor Sachlis, *Assistant Professor of Business Administration*
B.S. 1964, M.B.A. 1968, D.B.A. 1975, University of Maryland

Pilar G. Suelto de Saenz, *Associate Professor of Spanish*
Licenciada 1953, University of Madrid, M.A. 1957, Bryn Mawr College; Ph.D. 1966, University of Maryland

George Max Saiger, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1963, Harvard University; M.D. 1967, Albert Einstein College of Medicine

Carol Ruth St. Cyr, *Professor of Education*
B.S. 1946, Eastern Connecticut State College; M.A. 1949, Trinity College, Connecticut; Ph.D. 1955, University of Michigan

Stephen Walter Salant, *Assistant Professorial Lecturer in Economics*
B.A. 1967, Columbia University; Ph.D. 1973, University of Pennsylvania

Steven Charles Salop, *Associate Professorial Lecturer in Economics*
B.A. 1968, University of Pennsylvania, M.Phil 1971, Ph.D. 1972, Yale University

Burton Malcolm Sapin, *Professor of International Affairs and Political Science; Dean of the School of Public and International Affairs*
B.A. 1945, M.A. 1947, Columbia University; Ph.D. 1953, Princeton University

Stefan Otto Schiff, *Professor of Zoology*
B.S. 1952, Roanoke College; Ph.D. 1964, University of Tennessee, Knoxville

Richard Harold Schlagel, *Professor of Philosophy*
B.S. 1949, Springfield College; M.A. 1952, Ph.D. 1955, Boston University

Jeffrey Schlom, *Adjunct Associate Professor of Genetics*
B.S. 1963, Ohio State University; M.S. 1966, Adelphi University; Ph.D. 1969, Rutgers University, New Brunswick

William Edward Schmidt, *Professor of Chemistry*
B.S. 1943, M.S. 1950, George Washington University; M.A., Ph.D. 1953, Princeton University

* On sabbatical leave academic year 1977-78.
† On sabbatical leave fall semester 1977.

James Robert Schneider, *Assistant Professor of English*
B.A. 1965, M.A. 1967, Ph.D. 1974, Indiana University

Milton Allan Schwartz, *Associate Professorial Lecturer in Statistics*
B.S. 1938, City University of New York, City College

Lois Green Schwoerer, *Professor of History*
B.A. 1949, Smith College; M.A. 1952, Ph.D. 1956, Bryn Mawr College

Norman Orville Scribner, Jr., *Assistant Professorial Lecturer in Music (Organ)*
Mus.B. 1961, Peabody Institute of Baltimore

Ormond Albert Seavey, *Assistant Professor of English*
B.A. 1966, Carleton College; M.A. 1967, Ph.D. 1976, Columbia University

Frank William Segel, *Associate Professorial Lecturer in Accounting*
B.S. 1959, Johns Hopkins University; M.B.A. 1964, M.Phil. 1971, Ph.D. 1972, George Washington University

Marilyn Strauss Sehmal, *Clinical Instructor in Art Therapy*
B.A. 1969, M.A. 1974, George Washington University

Barbara Rae Seidman, *Studio Lecturer in Applied Music (Harp)*
Mus.B. 1969, Cleveland Institute of Music; Mus.M. 1970, Northwestern University

Richard Paul Seifert, *Assistant Professor of Biology*
B.A. 1968, Grinnell College; Ph.D. 1974, State University of New York at Stony Brook

JoAnne Sellars, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1957, University of Tennessee, Knoxville

Anastasia Seremetis, *Assistant Professorial Lecturer in Art*
B.A. 1973, M.F.A. 1975, George Washington University

Alice Cecilia Shadell, *Lecturer in English*
B.S. 1967, Loyola University of Chicago; M.A. 1969, Georgetown University

Elwood Lewis Shafer, *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1956, M.F. 1957, Pennsylvania State University; Ph.D. 1966, State University of New York, College of Environmental Science and Forestry

Stephen Shaffer, *Assistant Professor of Political Science*
B.A. 1968, University of Colorado; M.A. 1970, Ph.D. 1975, University of Michigan

Robert Poindexter Sharkey, *Professor of Economic History*
B.A. 1948, Princeton University; Ph.D. 1958, Johns Hopkins University

Thomas Elliott Shaughnessy, *Associate Professor of Management, George Washington University Program (Tidewater Area Center), Hampton, Virginia*
B.S. 1933, Massachusetts Institute of Technology; M.A. in Ed. 1948, George Washington University; Ed.D. 1957, Johns Hopkins University

Lawrence Shaw, *Research Professor of Statistics*
B.A. 1935, Ohio Wesleyan University; M.A. 1936, University of Pennsylvania

Stanley Newton Sherman, *Associate Professor of Business Administration*
B.A. 1952, M.B.A. 1960, University of Maryland

Chung-wen Shih, *Professor of Chinese*
B.A. 1945, St. John's University, China; M.A. 1949, Ph.D. 1955, Duke University

Milton Shore, *Professorial Lecturer in Psychology*
B.A. 1949, Harvard University; M.A. 1950, Boston University

Jay Robert Shotel, *Associate Professor of Special Education*
B.A. 1967, Ed.M. 1970, Ed.D. 1972, Temple University

Robert George Shouldice, *Assistant Professor of Health Care Administration*
B.A. 1966, Lycoming College; M.B.A. 1969, D.B.A. 1974, George Washington University

Walter Allen Shropshire, Jr., *Professorial Lecturer in Botany*
B.S. 1954, M.S. 1956, Ph.D. 1958, George Washington University

Eugene Joseph Shuchart, *Assistant Professorial Lecturer in Accounting*
B.S. 1950, Villanova University; M.B.A. 1951, University of Pennsylvania; C.P.A. 1956, State of Virginia

Robert Hermann Shumway, *Professor of Statistics*
B.A. 1958, Carleton College; M.S. 1960, Iowa State University of Science and Technology; Ph.D. 1965, George Washington University

Sally Annette Sibley, *Assistant Professorial Lecturer in Psychology*
B.A. 1962, Winthrop College; M.S. 1964, Ph.D. 1966, Florida State University

Robin Christopher Sickles, *Assistant Professor of Economics*
B.S. 1972, Georgia Institute of Technology; Ph.D. 1976, University of North Carolina

Herschel Sidransky, *Professor of Pathology*
B.S. 1948, M.D. 1953, M.S. 1958, Tulane University

Frederic Richard Siegel, *Professor of Geochemistry*
B.A. 1954, Harvard University; M.S. 1958, Ph.D. 1961, University of Kansas

Robert Sumner Sigafoos, *Professorial Lecturer in Botany*
B.S. 1942, M.S. 1943, Ohio State University; M.A. 1949, Ph.D. 1951, Harvard University

Gaston Sigur, *Professor of International Affairs; Director, Institute for Sino-Soviet Studies*
Ph.D. 1957, University of Michigan

David Elliot Silber, *Professor of Psychology*
B.A. 1958, Wayne State University; M.A. 1960, Ohio University; Ph.D. 1965, University of Michigan

Peter Silberman, *Professorial Lecturer in Journalism*
B.A. 1952, City University of New York, Queens College; M.A. 1956, University of Missouri

Suzanne Lee Simons, *Associate Professor of Anthropology*
B.A. 1948, Ohio State University; M.A. 1964, Ph.D. 1969, University of New Mexico

Richard Sines, *Assistant Professor of Economics*
B.A. 1965, Miami University; M.S. 1969, M.A. 1972, Ph.D. 1975, Ohio State University

Daniel Sinick, *Professor of Education*
B.A. 1936, City University of New York, City College; M.A. 1937, State University of New York at Albany; Ph.D. 1955, New York University

Eric Scott Sirulnik, *Visiting Associate Professor of Law*
B.A. 1965, Franklin and Marshall College; J.D. 1968, Boston University; LL.M 1970, George Washington University

Myrna Carol Sislen, *Studio Lecturer in Applied Music (Guitar)*
B.A. 1970, American University

Charles Smiley, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1965, University of Florida; J.D. 1967, University of Alabama; M.F.S. 1975, George Washington University

Arthur Hall Smith, *Assistant Professor of Painting*
B.F.A. 1951, Illinois Wesleyan University

Benjamin Williams Smith, *Professor of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University

George Wilson Smith, *Associate Professor of Education*
B.A. 1953, Central State College; Ed.M. 1965, Ed.D. 1971, University of Maryland

Joseph Thurston Smith, *Associate Professorial Lecturer in Forensic Sciences*
M.D. 1952, University of Alberta

Steven Neal Smith, *Lecturer in Human Kinetics and Leisure Studies*

Walton Edward Smith, *Associate Professor of Management Science*
B.S. 1960, M.S. 1962, University of Missouri; D.Sc. 1972, George Washington University

William Arthur Smith, *Associate Professor of Mathematics*
B.A. 1941, M.A. 1947, Syracuse University

Richard Saxon Snell, *Professor of Anatomy and of Orthopaedic Surgery*
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, University of London

Olav Christen Snellingen, *Professorial Lecturer in Economics*
LL.M. 1957, Oslo University, Norway

Jeanne Ellen Snodgrass, *Associate Professor of Human Kinetics and Leisure Studies*
B.A. 1952, Ohio Wesleyan University; M.S. in P.E. 1953, Smith College; Ed.D. 1975, University of North Carolina at Greensboro

Nancy Joan Shore Sobel, *Assistant Professor of Special Education*
B.S. 1966, University of Michigan; M.A. in Ed. 1970, George Washington University

Israel Gregory Sohn, *Adjunct Professor of Geology*
B.S. 1935, City University of New York, City College; M.A. 1938, Columbia University; Ph.D. 1965, Hebrew University, Israel

Henry Solomon, *Professor of Economics; Dean of the Graduate School of Arts and Sciences*
B.A. 1949, City University of New York, Brooklyn College, M.A. 1950, Ph.D. 1959, New York University

Thomas Songster, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, Doane College; M.A. 1963, Northeast Missouri State University; Ph.D. 1967, University of Utah

Paul Eppley Spiegler, *Associate Professorial Lecturer in Biological Sciences*
B.S. 1956, University of Maryland; M.A. 1959, George Washington University

*Loretta May Stallings, *Professor of Human Kinetics and Leisure Studies*
B.A. 1947, Stanford University; M.A. 1950, University of the Pacific; Ed.D. 1965, University of Texas at Austin

George Stambuk, *Professor of International Affairs*
Abs.Jur. 1943, University of Zagreb, Yugoslavia; M.A. 1956, Ph.D. 1961, Indiana University at Bloomington

John Murry Starrels, *Assistant Professor of Political Science and International Affairs*
B.A. 1965, University of California, Berkeley; M.A. 1969, California State University, San Francisco; Ph.D. 1972, University of California, Santa Barbara

James Edward Starrs, *Professor of Law*
B.A., LL.B., 1958, St. John's University, New York; LL.M. 1959, New York University

Donald Eugene Starsinic, *Assistant Professorial Lecturer in Geography and Regional Science*
B.A. 1952, University of Pittsburgh; M.A. 1957, University of Chicago

Clarence Steinberg, *Assistant Professorial Lecturer in English*
B.A. 1953, City University of New York, City College; M.A. 1957, University of Connecticut; Ph.D. 1969, University of Pennsylvania

Carl Steiner, *Associate Professor of German*
B.A. 1958, M.A. 1962, Ph.D. 1966, George Washington University

George Steiner, *Professor of Music; Director of Orchestra*
B.S. 1938, Johns Hopkins University; Mus.B. 1939, Mus.M. 1940, Peabody Institute of Baltimore

Christopher Willie Sten, *Assistant Professor of English*
B.A. 1966, Carleton College; M.A. 1968, Ph.D. 1971, Indiana University at Bloomington

Richard Walton Stephens, *Professor of Sociology*
B.A. 1951, Franklin and Marshall College; M.A. 1953, Ph.D. 1956, University of North Carolina

Betsy Lee Hodges Sterman, *Lecturer in English*
B.A. 1953, Agnes Scott College; M.A. 1956, George Washington University

Charles Todd Stewart, Jr., *Professor of Economics*
B.A. 1946, M.A. 1948, Ph.D. 1954, George Washington University

Phyllis Langton Stewart, *Assistant Professor of Sociology*
B.A. 1961, M.A. 1962, California State University, Los Angeles; Ph.D. 1968, University of California, Los Angeles

*On sabbatical leave spring semester 1978

*Eugene Almon Stone, *Associate Professor of Mathematics*
B.A. 1960, Vanderbilt University; Ph.D. 1966, University of Virginia

James Ashley Straw, *Professor of Pharmacology*
B.S. 1958, Ph.D. 1963, University of Florida

Margaret Ann Strom, *Lecturer in English*
B.A. 1967, American University; M.A. 1970, University of Maryland

George Stuart, *Associate Professorial Lecturer in Anthropology*
B.S. 1956, University of South Carolina; M.A. 1970, George Washington University

Theodore Suranyi-Unger, Jr., *Research Professor of Economics*
B.A. 1950, Syracuse University; Dr. rer. pol. 1957, University of Vienna

Amin Mohammed Suria, *Assistant Professor of Pharmacology*
B.S. 1963, M.S. 1964, University of Karachi, Pakistan; Ph.D. 1971, Vanderbilt University

Sterling Scott Sutton, *Associate Professorial Lecturer in Economics*
B.A. 1952, M.A. 1956, University of Florida; M.A. 1964, Ph.D. 1968, George Washington University

Milica Hasalova Svehla, *Lecturer in Human Kinetics and Leisure Studies*
B.S. in Ed. 1954, George Washington University

Paravastu Swamy, *Adjunct Professor of Economics*
M.A. 1957, M.S. 1958, Andhra University, India; Ph.D. 1968, University of Wisconsin

Richard Switalski, *Research Instructor in Health Care Administration*
B.A. 1962, Miami University; M.S. 1964, Kent State University

Choy-Tak Taam, *Professor of Mathematics*
B.S. 1942, University of Illinois; M.A. 1943, Ph.D. 1945, Harvard University

Roland Henry Tanck, *Associate Research Professor of Psychology*
B.A. 1939, University of Wisconsin; M.A. 1948, Ph.D. 1956, George Washington University

Morton Frank Taragin, *Assistant Professor of Physics*
B.S. in Engr. 1965, M.Phil. 1969, Ph.D. 1970, George Washington University

Theodore Walter Taylor, *Professorial Lecturer in Public Administration*
B.A. 1935, University of Arizona; M.A. 1936, Syracuse University; Ph.D. 1960, Harvard University

Thomas Clinton Teeples, *Assistant Professorial Lecturer in Statistics*
B.S. 1966, George Washington University

Albert Harris Teich, *Associate Professor of Public Affairs*
B.S. 1964, Ph.D. 1969, Massachusetts Institute of Technology

Geza Teleki, *Professor of Geology*
Ph.D. 1936, University of Vienna

Douglas Harold Teller, *Associate Professor of Design and Graphics*
B.A. 1956, Western Michigan University; M.F.A. 1962, George Washington University

Stanley Tesko, *Assistant Professorial Lecturer in Business Administration*
B.S. 1962, University of Maryland; M.S. in B.A. 1968, George Washington University

Alvin Thaler, *Professorial Lecturer in Mathematics*
B.A. 1959, Columbia University; Ph.D. 1966, Johns Hopkins University

Jean-François Marie Thibault, *Assistant Professor of French*
Baccalaureat 1960, Licence es Lettres 1964, Diplôme d'Etudes 1965, Academie de Paris; Ph.D. 1976, University of Maryland

Klaus Thoenelt, *Professor of German*
Staatsexamen 1956, Ph.D. 1961, University of Freiburg

*Raymond Edward Thomas, *Associate Professor of Statistics*
B.A. 1955, M.A. 1957, M.Phil. 1971, George Washington University

Irene Thompson, *Associate Professor of Russian*
B.S. 1965, M.S. 1969, Georgetown University

Ronald Bettes Thompson, *Professor of European History*
B.A. 1935, Yale University; Ph.D. 1954, University of Chicago

* On sabbatical leave fall semester 1977.

Richard Thornton, *Professor of History*
B.A. 1961, Colgate University; Ph.D. 1966, University of Washington

Francisco Thoumi, *Assistant Professor of Economics*
Economista 1964, University of the Andes, Colombia; Ph.D. 1973, University of Minnesota

Samuel Thurm, *Professorial Lecturer in Business Administration*
B.A. 1939, Dartmouth College; M.B.A. 1941, Columbia University

Charles Stanley Tidball, *Henry D. Fry Professor of Physiology and Research Professor of Medicine*
B.A. 1950, Wesleyan University; M.S. 1952, University of Rochester; Ph.D. 1955, University of Wisconsin; M.D. 1958, University of Chicago

Mary Elizabeth Tidball, *Professor of Physiology*
B.A. 1951, L.H.D. 1976, Mount Holyoke College; M.S. 1955, Ph.D. 1959, University of Wisconsin; Sc.D. 1973, Wilson College; D.Sc. 1974, Trinity College, District of Columbia

Neil Avrill Tilkens, *Associate Professor of Music*
Mus.B. 1950, Columbia Union College; Mus.M. 1952, Philadelphia Conservatory of Music

Rodney Tillman, *Professor of Education; Dean of the School of Education*
B.A. 1943, Henderson State College; M.A. 1949, Ed.D. 1955, Columbia University

Barbara Mills Timberlake, *Associate Professorial Lecturer in Biological Sciences*
B.S. 1952, George Washington University; M.A. 1955, Amherst College

Edwin Timbers, *Professor of Government and Business Relations*
B.A. 1944, West Virginia University; M.A. 1951, Ph.D. 1954, University of Michigan

Nicholas Diggs Tiscione, *Assistant Professor of Special Education*
B.A. 1968, M.A. 1972, Ph.D. 1974, Hofstra University

George Todaro, *Adjunct Professor of Genetics*
B.A. 1958, Swarthmore College; M.D. 1963, New York University

Margaret Cooper Tolson, *Adjunct Assistant Professor of Music*
Mus.B. 1931, Mus.M. 1936, University of Rochester

William George Torpey, *Professorial Lecturer in Public Administration*
B.A., M.A. 1945, State University of New York at Albany; Ph.D. 1941, New York University

Lewis Rhodes Townsend, *Lecturer in Biological Sciences*
B.S. 1975, George Washington University

Carleton Raymond Treadwell, *Professor of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

Carl Augustus Troester, Jr., *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1937, Northeast Missouri State University; M.A. 1938, University of Missouri; Ed.D. 1952, Columbia University

Joseph Louis Tropea, *Assistant Professor of Sociology*
B.A. 1962, Wayne State University; M.A. 1965, Michigan State University; Ph.D. 1973, George Washington University

Philip True, *Associate Professorial Lecturer in Geography*
B.A. 1948, Western Michigan University; M.S. 1950, University of Chicago

Linda Albertson Tsantis, *Assistant Professor of Special Education*
B.A. 1965, M.A. 1970, Old Dominion University; Ed.D. 1974, George Washington University

James Michael Tubbs, *Assistant Professor of French*
B.A. 1962, M.A. 1969, University of Texas at Austin

David George Tuerck, *Associate Professorial Lecturer in Economics*
B.A. 1962, M.A. 1964, George Washington University; Ph.D. 1966, University of Virginia

Mortimer Darling Turner, *Associate Professorial Lecturer in Geology*
B.S. 1943, M.S. 1954, University of California, Berkeley; Ph.D. 1972, University of Kansas

Curtis Edward Tuthill, *Associate Professor of Psychology*
B.A. 1935, Macalester College; M.A. 1936, Ph.D. 1939, University of Iowa

On sabbatical leave academic year 1977-78.

Elinor Ulman, *Adjunct Assistant Professor of Art Therapy*
B.A. 1930, Wellesley College; B.S. 1943, Iowa State University of Science and Technology

Stuart Umpleby, *Assistant Professor of Management Science*
B.S., B.A. 1967, M.A. 1969, Ph.D. 1975, University of Illinois

George Vartkes Vahouny, *Professor of Biochemistry*
B.S. 1953, M.S. 1955, Ph.D. 1958, George Washington University

Peter B. Vaill, *Professor of Management Science; Dean of the School of Government and Business Administration*
B.A. 1956, University of Minnesota; M.B.A. 1960, D.B.A. 1964, Harvard University

Peter John Verhoven, *Adjunct Associate Professor of Human Kinetics and Leisure Studies*
B.A. 1963, Morehead State University; M.S. 1965, Ed.D. 1969, Indiana University at Bloomington

Robert Corbin Vincent, *Professor of Chemistry*
B.A. 1935, M.A. 1937, Ph.D. 1940, Cornell University

Barbara Ann Von Barghahn, *Assistant Professor of Art*
B.A. 1970, University of Iowa; M.A. 1972, New York University

Clemmont Eyvind Vontress, *Professor of Education*
B.A. 1952, Kentucky State College; M.S. 1956, Ph.D. 1965, Indiana University at Bloomington

Richard David Walk, *Professor of Psychology*
B.A. 1942, Princeton University; M.A. 1947, University of Iowa; M.A. 1949, Ph.D. 1950, Harvard University

Cynthia Walker, *Instructor in English*
B.A. 1970, Denison University; M.A. 1972, Ph.D. 1974, Purdue University

Glenn Anthony Walker, *Associate Professor of Biochemistry*
B.A. 1958, Bellarmine College; Ph.D. 1968, Michigan State University

Robert Harris Walker, Jr., *Professor of American Civilization*
B.S. 1945, Northwestern University; M.A. 1950, Columbia University; Ph.D. 1955, University of Pennsylvania

Dewey Wallace, Jr., *Professor of Religion*
B.A. 1957, Whitworth College; B.D. 1960, Princeton Theological Seminary; M.A. 1962, Ph.D. 1965, Princeton University

Ruth Ann Wallace, *Professor of Sociology*
B.A. 1961, Immaculate Heart College; M.A. 1963, University of Notre Dame; Ph.D. 1967, University of California, Berkeley

Regis Hills Walther, *Professorial Lecturer in Management Science*
B.A. 1941, University of California, Los Angeles; M.A. 1960, Ph.D. 1963, George Washington University

Christine Wen Wang, *Clinical Instructor in Art Therapy*
B.A. 1954, Connecticut College

George Ching Yuan Wang, *Assistant Professor of Chinese*
B.A. 1951, Taiwan Normal University, M.S. 1955, Tokyo University of Education

William Arthur Ward, *Professorial Lecturer in Management Science*
B.A. 1961, M.A. 1968, Ph.D. 1970, University of Colorado

Thomas Howard Wardlow, *Studio Lecturer in Applied Music (Percussion Instruments)*
B.S. 1962, M.S. 1964, University of Illinois

James Hutchinson Ware, *Associate Professorial Lecturer in Statistics*
B.A. 1963, Yale University; Ph.D. 1969, Stanford University

Charles Woodrow Washington, *Assistant Professor of Public Administration*
B.A. 1968, M.P.A. 1971, Florida Atlantic University; Ph.D. 1976, Syracuse University

Don Wayne Watkins, *Associate Professor of Physiology*
B.Ch.E. 1963, University of Louisville; Ph.D. 1968, University of Wisconsin

Maria Soukhanova Watson, *Lecturer in Russian*
B.A. 1967, M.A. 1972, George Washington University

Stephen Jay Wayne, *Associate Professor of Political Science and Public Affairs*
B.A. 1961, University of Rochester; M.A. 1963, Ph.D. 1968, Columbia University

Edward Ronald Weismiller, *Professor of English*
B.A. 1936, Litt.D. 1953, Cornell College; M.A. 1942, Harvard University; D.Phil. 1950 Oxford University

Priscilla Welling, *Assistant Professor of Accounting*
B.A. 1966, City University of New York, Queens College; M.S. 1970, Rensselaer Polytechnic Institute; Ph.D. 1974, New York University

Peter Werres, *Lecturer in German*
M.Phil. 1972, George Washington University

Harvey Robert Wertlieb, *Associate Professorial Lecturer in Health Care Administration*
B.A. 1961, M.B.A. 1964, George Washington University

John Lee Westrate, *Professorial Lecturer in Public Administration*
B.A. 1944, Illinois College; M.A. 1949, Ph.D. 1963, University of Chicago

David Gover White, *Professor of Chemistry*
B.Ch.E. 1950, Cornell University; Ph.D. 1954, Harvard University

Anne Elizabeth White, *Studio Lecturer in Applied Music (Voice)*
Mus.B. 1950, University of Rochester; M.A. 1963, American University

Richard Otis White, *Studio Lecturer in Applied Music (Oboe)*
Mus.B. 1950, University of Rochester

Robert Lanon White, *Adjunct Associate Professor of Health Care Administration*
B.S. 1964, Naval Postgraduate School; M.S. in Fin. Mgt. 1966, George Washington University; Ph.D. 1970, University of Iowa

Garland Dean Wiggs, *Associate Professor of Education*
B.B.A. 1956, University of Cincinnati; M.A. 1960, University of Northern Colorado; Ed.D. 1971, George Washington University

John Theodore Wieseman, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1958, Wesleyan University; LL.B. 1963, Columbia University

Gail Roggin Wilensky, *Associate Professorial Lecturer in Economics*
B.A. 1964, M.A. 1965, Ph.D. 1968, University of Michigan

Robert Crumpton Willson, *Associate Professor of Journalism*
B.A. 1951, George Washington University

Bruce Simon Wine, *Assistant Professorial Lecturer in Education*
B.A. 1970, University of Virginia; M.A. 1972, Ph.D. 1975, University of Notre Dame

Robert Martin Winick, *Associate Professorial Lecturer in Urban and Regional Planning*
B.S.C.E. 1965, The Cooper Union; M.C.P. 1967, Yale University; Ph.D. 1974, University of North Carolina

Lawrence Winkler, *Associate Professor of Education*
B.S. 1952, M.A. 1954, Washington University; Ed.D. 1965, George Washington University

Erik Kenelm Winslow, *Associate Professor of Behavioral Sciences*
B.S. 1963, Pennsylvania State University; M.S. 1965, Ph.D. 1967, Case Western Reserve University

Maida Rust Withers, *Associate Professor of Human Kinetics and Leisure Studies*
B.A. 1958, Brigham Young University; M.S. 1960, University of Utah

Thomas William Wolfe, *Professorial Lecturer in International Affairs*
B.A. 1935, Hiram College; M.A. 1950, Columbia University; Ph.D. 1955, Georgetown University

Roger Alan Wolff, *Clinical Instructor in Art Therapy*
B.A. 1956, University of Maryland; M.Phil. 1973, George Washington University

Kirk Marcus Wolter, *Associate Professorial Lecturer in Statistics*
B.A. 1970, St. Olaf College; M.S. 1972, Ph.D. 1974, Iowa State University

Reuben Esselstyn Wood, *Professor of Chemistry*
B.S. 1936, Ph.D. 1939, California Institute of Technology; M.S. 1937, University of Chicago

William Thomas Woodward, *Assistant Professor of Painting*
B.A. 1957, M.A. 1961, American University

Arthur Gilbert Wright, *Associate Professorial Lecturer in Anthropology*
B.A. 1932, Carthage College; M.S. 1947, University of Illinois

John Franklin Wright, Jr., *Assistant Professor of Drawing and Graphics*
B.A. 1954, American University; M.A. 1960, University of Illinois

William Ralph Wright, *Studio Lecturer in Applied Music (Clarinet and Saxophone)*
Diploma 1961, Curtis Institute of Music; Mus.M. 1971, Catholic University of America

Jean Marie Gladding Wuckovich, *Lecturer in English*
B.A. 1964, M.A. 1966, George Washington University

Mary Xiroyanni, *Assistant Professor of Classics*
B.A. 1964, University of Athens; Ph.D. 1972, University of Wisconsin

Helen Bates Yakobson, *Professor of Russian*
B.S. 1935, Harbin Law School, Manchuria

Kenneth Chi-Kun Yang, *Assistant Research Professor of Health Care Administration*
B.A. 1960, West Georgia College; B.A. in P.A. 1963, Taiwan Institute of Public Administration

*Harry Elwood Yeide, Jr., *Professor of Religion, Assistant Dean of Columbian College of Arts and Sciences*
B.A. 1953, Williams College; B.D. 1957, Union Theological Seminary; Ph.D. 1966, Harvard University

John Edward Yellen, *Assistant Research Professor of Anthropology*
B.A. 1964, Hobart and William Smith Colleges; M.A. 1966, Ph.D. 1974, Harvard University

Anthony Marvin Yezer, *Associate Professor of Economics*
B.S. 1966, Dartmouth College; M.S. 1967, London School of Economics and Political Science; Ph.D. 1974, Massachusetts Institute of Technology

Richard Yi-chang Yin, *Associate Professor of Economics*
LL.B. 1946, Fu Jen University, China; M.A. 1950, University of Denver; Ph.D. 1966, Columbia University

Malcolm Black Young, *Assistant Professorial Lecturer in Public Administration*
B.A. 1962, Wabash College; M.P.I.A. 1964, Ph.D. 1972, University of Pittsburgh

Ronald David Young, *Adjunct Assistant Professor of English*
B.A. 1964, Seton Hall University

Meira Ellen Zedek, *Associate Clinical Professor of Psychology*
B.A. 1951, Hebrew University, Israel; M.A. 1954, Ph.D. 1958, Boston University

Betty Zeiger, *Clinical Instructor in Art Therapy*
B.A. 1962, M.A. 1964, American University

Eileen Rachel Zeitz, *Adjunct Assistant Professor of Sociology*
B.A. 1968, M.A. 1971, George Washington University; Ph.D. 1976, American University

Isidore Zeitz, *Professorial Lecturer in Geology*
B.S. 1939, M.S. 1940, City University of New York, City College

Isaiah Morris Zimmerman, *Associate Clinical Professor of Psychology*
B.A. 1951, M.S.W. 1953, University of California, Berkeley; Ph.D. 1967, Catholic University of America

John Edmund Ziolkowski, *Associate Professor of Classics*
B.A. 1958, Duke University; Ph.D. 1963, University of North Carolina

Thomas William Zito, Jr., *Assistant Professorial Lecturer in Journalism*
B.A. 1970, Georgetown University

Bernard Charles Zook, *Associate Professor of Pathology (Comparative)*
B.S. 1962, D.V.M. 1963, Colorado State University

* On sabbatical leave academic year 1977-78.

Artley Joseph Zuchelli, *Professor of Physics*
B.A. 1955, Ph.D. 1958, University of Virginia

Anita Meinberg Zwick, *Adjunct Assistant Professor of English*
B.A. 1964, Lake Erie College; M.A. 1966, Columbia University

Jack Zwick, *Professor of Business Administration*
B.A. 1959, D.B.A. 1964, Harvard University; M.B.A. 1961, George Washington University

CONSULTANTS IN RESEARCH—GRADUATE SCHOOL OF ARTS AND SCIENCES

James Adkins, *Chief, Nutritional Sciences Branch, Division of Nutrition, U.S. Food and Drug Administration*; Biological Sciences (Nutrient Bioavailability)
B.S. 1953, Virginia State College; M.S. 1958, Ph.D. 1961, University of Wisconsin

Elizabeth Potts Anderson, *Research Biochemist, Laboratory of Biochemistry, National Cancer Institute*; Metabolism of Purines and Pyrimidines
B.A. 1945, Sarah Lawrence College; M.S. 1947, University of Wisconsin; Ph.D. 1951, Stanford University

W. French Anderson, *Head, Section on Molecular Hematology, National Heart and Lung Institute*; Genetics
B.A. 1958, M.D. 1963, Harvard University; M.A. 1960, Cambridge University

Aftab Ahmed Ansari, *Head, Cellular Immunology Division, Naval Medical Research Institute, National Naval Medical Center*; Microbiology (Immunology)
B.S. 1961, D.J. Government Science College, Pakistan; M.S. 1963, University of Karachi; M.S. 1967, University of California, Los Angeles; Ph.D. 1970, University of Arizona

Franklyn Arnhoff, *Chief, Program Analysis Section, Training and Manpower Resources Branch, National Institute of Mental Health*; Experimental Psychology
B.S. 1948, Long Island University; M.A. 1949, New York University; Ph.D. 1953, Northwestern University

William Back, *Research Hydrologist, U.S. Geological Survey*; Geology (Hydrogeology)
B.S. 1948, University of Illinois; M.S. 1955 University of California, Berkeley; M.P.A. 1956, Harvard University; Ph.D. 1959, University of Nevada

Jerry Laurens Barnard, *Curator, Division of Crustacea, U.S. National Museum of Natural History, Smithsonian Institution*; Crustacean Biology
B.A. 1949, M.S. 1950, Ph.D. 1953, University of Southern California

Charles Bell, *Program Director, Statistics Branch, Mathematical Sciences Division, National Science Foundation*; Statistics (Statistical Theory)
B.S. 1947, Xavier University of Louisiana; M.S. 1948, Ph.D. 1953, Notre Dame University

Joseph Bellanti, *Professor of Pediatrics and of Microbiology, Georgetown University School of Medicine*; Microbiology (Immunology)
B.S. 1954, M.D. 1958, State University of New York at Buffalo

Larry Bilker, *Chief Psychologist, Bradley Day Hospital, Rhode Island*; Psychology (Family and Child Diagnosis and Therapy)
B.A. 1960, City University of New York, Brooklyn College; M.A. 1966, Ph.D. 1970, University of Florida

Ethel Joan Blanchette-Mackie, *Director, Electron Microscopy Laboratory, Section for Nutrition and Endocrinology, National Institute of Arthritis, Metabolism and Digestive Diseases*; Biology of Lipids
B.S. 1956, City University of New York, Queens College; M.S. 1959, New York University; Ph.D. 1965, Columbia University

Larry Bockstahler, *Chief, Pathologic Studies Section, Division of Biologic Effects, Bureau of Radiological Health, Food and Drug Administration, U.S. Department of Health, Education and Welfare Public Health Service;* **Genetics (Radiation Bio-effects)**
B.S. 1956, Michigan State University; M.S. 1961, Ph.D. 1964, University of Wisconsin

Charles Boone, *Head, Cell Biology Section, Viral Biology Branch, National Cancer Institute;* Microbiology (Virology)
M.D. 1951, University of California, San Francisco; Ph.D. 1963, University of California, Los Angeles

Wallace Bowman, *Chief, Environment and Natural Resources Policy Division and Senior Specialist in Environmental Policy, Congressional Research Service, Library of Congress;* American Civilization (Man, Nature and Environment)
B.A. 1949, M.S. 1953, Washington University; M.A. 1956, Yale University

Roscoe Brady, Jr., *Chief, Section on Lipid Chemistry, Laboratory of Neurochemistry, National Institute of Neurological Diseases and Blindness;* **Complex Lipids**
B.S. 1943, Pennsylvania State University; M.D. 1947, Harvard University

David Brandes, *Associate Chief of Pathology, Baltimore City Hospitals* **Biological Sciences (Cell Biology)**
M.D. 1948, University of Buenos Aires, Argentina

Milton Brightman, *Head, Section on Neurocytology, Laboratory of Neuropathology and Neuroanatomical Sciences, National Institute of Neurological Diseases;* **Anatomy (Neuroanatomy)**
B.S. 1945, M.A. 1948, University of Toronto, Canada; Ph.D. 1954, Yale University

Charles Philip Butcher, *Professor of English and Dean of the Graduate School, Morgan State College;* American Civilization (Afro-American Literature and History)
B.A. 1942, M.A. 1947, Howard University; Ph.D. 1956, Columbia University

Bruce Collette, *Assistant Director, Bureau of Commercial Fisheries, Systematics Laboratory, Smithsonian Institute;* Biology of Fishes
B.S. 1956, Ph.D. 1960, Cornell University

Clyde Dawe, *Head, Comparative Oncology Section, Laboratory of Pathology, National Cancer Institute;* Biological Sciences (Oncology)
B.A. 1942, Lafayette College; M.D. 1945, Johns Hopkins University; Ph.D. 1956, University of Minnesota

George Curtis Eads, *Assistant Director, Government Operation and Research, Council on Wage and Price Stability;* Economics (Industrial Organization)
B.A. 1964, University of Colorado; M.A. 1965, M.Phil. 1967, Ph.D 1968, Yale University

Gerald Arthur Eddy, *Chief, Division of Virology, U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick;* Virology
B.S. 1953, D.V.M. 1955, Michigan State University; Ph.D. 1968, University of Notre Dame

John Farrar, *Senior Staff Fellow, National Institute of Dental Research* **Microbiology (Immunology)**
B.A. 1966, M.S. 1968, Miami University; Ph.D. 1972, University of Notre Dame

Mattie Rae Spivey Fox, *Chief, Minerals Section, Nutritional Screening Branch, Division of Nutrition, U.S. Food and Drug Administration;* Biochemistry (Mineral Nutrition)
B.S. 1943, Texas Women's University; M.S. 1945, Iowa State University; Ph.D. 1953, George Washington University

Victor Frattali, *Chief, Laboratory of Nutritional Biochemistry and Metabolism, Naval Medical Research Institute, National Naval Medical Center* **Structure and Function of Enzymes**
B.S. 1959, University of Scranton; Ph.D. 1965, Georgetown University

John Eric Fredland, *Professor of Economics, U.S. Naval Academy*; Public Finance
B.A. 1964, Harvard University; M.A. 1966, Ph.D. 1970, University of Michigan

Francois Naftali Frenkiel, *Physicist, Applied Physics Laboratory, Johns Hopkins University*; Theoretical Physics (Aerodynamics)
Dip.M.E. 1933, Dip.Ae.E. 1937, University of Ghent, Belgium; Ph.D. 1946, University of Lille, France

Robert Gibbs, Jr., *Chairman, Department of Vertebrate Zoology National Museum of Natural History, Smithsonian Institution*; Vertebrate Zoology
B.A. 1951, Ph.D. 1955 Cornell University

Joseph Goldstein, *Assistant Professor of Metallurgy, Department of Metallurgy and Material Science, Lehigh University*; Meteorite Study
B.S. 1960, M.S. 1962, D.Sc. 1964, Massachusetts Institute of Technology

Robert Goldstein, *Chief, Pulmonary Immunology Research Laboratory, Veterans Administration Hospital*; Microbiology (Immunology)
B.A. 1962, Brandeis University, M.D. 1966, Jefferson Medical College; Ph.D. 1976, George Washington University

James Granger, *Chief of Child Guidance Service and Director of Training, Walter Reed General Hospital*; Art Therapy
B.A. 1955, University of California, Berkeley; M.D. 1961, University of Rochester

Tibor Jack Greenwalt, *National Medical Director, American National Red Cross*; Cellular Physiology
B.A. 1934, M.D. 1937, New York University

Gordon Guroff, *Head, Section on Intermediary Metabolism, Laboratory of Biomedical Sciences, National Institute of Child Health and Human Development*; Amino Acid Metabolism
B.S. 1954, University of Illinois, M.S. 1956, Auburn University; Ph.D. 1959, University of Wisconsin

John Hardt, *Senior Specialist in Soviet Economics, Congressional Research Service, Economic Division, Library of Congress*; Soviet Economics (Comparative Economic Systems)
B.A. 1945, M.A. 1948, University of Washington; M.A. 1950, Ph.D. 1955, Columbia University

Henry Field Haviland, Jr., *Senior Staff Member, Brookings Institution*; International Relations (American Foreign Policy)
B.A. 1941, M.A. 1946, Ph.D. 1949, Harvard University

Joseph Ernest Hazel, *Research Geologist, Paleontology and Stratigraphy Branch, U.S. Geological Survey*; Paleontology
B.A. 1956, M.A. 1960, University of Missouri; Ph.D. 1963, Louisiana State University and Agricultural and Mechanical College

Ronald Herberman, *Head, Cellular and Tumor Immunology Section, Laboratory of Cell Biology, National Cancer Institute*; Tumor Immunology
B.A. 1960, M.D. 1964, New York University

Loren Horton, *State Historical Society of Iowa*; American Civilization (History of Iowa)
B.A. 1955, M.A. 1960, University of Northern Iowa

Richard Houbrick, *Supervisory Marine Biologist, Smithsonian Oceanographic Sorting Center, Smithsonian Institution*; Biological Sciences (Malacology)
B.A. 1959, St. Bernard College; M.S. 1967, University of Miami; Ph.D. 1971, University of South Florida

Thelma Hunt, *Professor Emeritus of Psychology, in Residence*; Abnormal Psychology
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

Lent Clifton Johnson, *Chief, Bone and Joint Pathology, Armed Forces Institute of Pathology;* Histology
B.S. 1931, M.D. 1935, University of Chicago

Meredith Leam Jones, *Curator, Division of Worms, Smithsonian Institution* Invertebrate Zoology
B.A. 1948, M.A. 1952, Ph.D. 1956, University of California, Berkeley

Shung-chang Jong, *Head, Mycology Department, American Type Culture Collection; Microbiology* (Microbiology)
B.S. 1960, National Taiwan University; M.S. 1966, Western Illinois University; Ph.D. 1968, Washington State University

Robert Konrad Kahn, *Psychotherapist (Private Practice);* Psychotherapy
B.A. 1946, University of Pennsylvania, M.A. 1953, George Washington University, Ph.D. 1957, Pennsylvania State University

Meir Kende, *Head, Immunology Division, Cancer Chemotherapy Department, Microbiological Associates, Inc.;* Immunology
M.S. 1960, Hebrew University, Israel, Ph.D. 1967, George Washington University

David Kohne, *Staff Member, Department of Terrestrial Magnetism, Biophysics Section, Carnegie Institution of Washington, D.C.;* Molecular Biology
B.A. 1960, Wabash College; Ph.D. 1965, Purdue University

Janos Ladik, *Visiting Scientist, Biophysics, Laboratory of Biophysical Chemistry, National Institute of Arthritis, Metabolism, and Digestive Diseases;* Physics
Chem. Engr. 1952, Technical University of Budapest; Doct. of Chem. Sciences 1971, Hungarian Academy of Sciences

Joseph Lambert, *Regional Research Psychologist, U.S. Civil Service Commission, Philadelphia Region;* Psychology (Psychology of Learning)
B.A. 1969, M.A. 1971, Ph.D. 1972, Temple University

Lawrence Stephen Lessin, *Professor of Medicine and Pathology, George Washington University School of Medicine and Health Sciences;* Hematology
M.D. 1962, University of Chicago

Robert Levy, *Director, Division of Heart and Vascular Diseases, National Heart and Lung Institute;* Biochemistry (Lipoproteins)
B.A. 1957, Cornell University; M.D. 1961, Yale University

Elsie Lewis, *Associate Professor of History and Chairman of the Department of History, Howard University;* Afro-American History
B.A. 1932, Fisk University, M.A. 1933, University of Southern California; Ph.D. 1946, University of Chicago

Darrell Liu, *Acting Section Chief, Biochemistry of Microbial Structure, National Institute of Child Health and Human Development;* Peptides and Protein Structure
B.S. 1955, National Taiwan University; Ph.D. 1961, University of Pittsburgh

Walter McKay Lovenberg, *Section Chief, Biochemical Pharmacology, Experimental Therapeutics Branch, National Heart and Lung Institute* Structure and Function of Proteins
B.S. 1956, M.S. 1958, Rutgers University, New Brunswick; Ph.D. 1962, George Washington University

William Madow, *Statistics* (Sample Survey Design)
B.A. 1932, M.A. 1933, Ph.D. 1938, Columbia University

Rose Mage, *Career Investigator, Laboratory of Immunology, National Institute of Allergy and Infectious Diseases;* Immunogenetics
B.S. 1956, Cornell University; Ph.D. 1963, Columbia University

George Reilly Martin, *Chief, Connective Tissue Section, Laboratory of Biochemistry, National Institute of Dental Research*; Connective Tissue
B.A. 1955, Colgate University; Ph.D. 1959, University of Rochester

Ladislaus Laszlo Marton, *Physicist, Atomic Physics, Electronics Division, National Bureau of Standards*; Electron Optics
Ph D. 1924, University of Zurich, Switzerland

Larry McGowan, *Associate Professor of Obstetrics and Gynecology*; Cytopathology
B.S. 1950, Millikin University; B.S. in Med. 1952, M.D. 1954, University of Illinois at the Medical Center

Barbara F. Meeker, *Associate Professor of Sociology, University of Maryland*; Sociology (Mathematical Sociology)
B.A. 1961, University of Kansas; M.A. 1964, Ph.D. 1966, Stanford University

Walter Mertz, *Biochemist Supervisor, Walter Reed Army Institute of Research*; Intermediary Metabolism
M.D. 1951, University of Mainz, Germany

John Minna, *Head, Section on Somatic Cell Genetics, Laboratory of Biochemical Genetics, National Heart and Lung Institute*; Somatic Cell Genetics
B.A. 1963, M.A. 1967, Stanford University

Mortimer Mishkin, *Research Psychologist, Section on Neuropsychology, National Institute of Mental Health*; Experimental Psychology
B.A. 1946, Dartmouth College; M.A. 1949, Ph.D. 1951, McGill University

Arturo Morales-Carrion, *Director of Historical Research, University of Puerto Rico*; Latin American Studies
B.A. 1935, University of Puerto Rico; M.A. 1936, University of Texas at Austin; Ph.D. 1950, Columbia University

William Guy Nash, Biological Sciences (Genetics)
B.S. 1963, M.A. 1965, University of Michigan

Sean O'Reilly, *Professor of Neurology*; Neurochemistry
M.B. 1949, M.D. 1952, National University of Ireland

John Parker II, *Project Director and Virologist, Microbiological Associates, Inc.*; Virology
B.S. 1957, M.S. 1961, Ph.D. 1965, University of Maryland

Diane Brickley Parsons, *Assistant Research Professor of Orthopedic Surgery, George Washington University School of Medicine and Health Sciences*; Biochemistry (Collagen)
B.A. 1968, Newton College; Ph.D. 1973, Boston University

Andrew Peacock, *Supervisory Research Chemist, National Cancer Institute*; Biological Sciences (Cell Biology)
B.S. 1943, M.S. 1947, Ph.D. 1949, Massachusetts Institute of Technology

Robert Lee Peters, *Virologist, Microbiological Associates, Inc.*; Microbiology (Virology)
B.S., M.S. 1963, Ph.D. 1967, University of Maryland

John Pisano, *Head, Section of Physiological Chemistry, Experimental Therapeutics Branch, National Heart and Lung Institute*; Physiological Chemistry
B.S. 1951, Pennsylvania State University; M.S. 1953, Ph.D. 1955, Rutgers University, New Brunswick

Christopher Polge, *Principal Scientific Officer, Agricultural Research Council of Great Britain, Unit of Reproductive Physiology and Biochemistry, Cambridge University*; Embryonic Development
B.S. 1948, University of Reading, England; Ph.D. 1956, University of London

Michael Potter, *Head, Immunochemistry Section, Laboratory of Cell Biology, National Cancer Institute*; Immunology
B.A. 1945, Princeton University; M.D. 1949, University of Virginia

Robert Miles Pratt, Jr., *Research Chemist, Craniofacial Anomalies Section, Laboratory of Developmental Biology and Anomalies, National Institute of Dental Research*; Pharmacology (Biochemical Teratogenesis)
B.A. 1965, M.A. 1966, University of Colorado; Ph.D. 1970, Boston University

Paul Price, *Assistant Scientific Director, Torrey Pines Research Center, Ca*: Microbiology (Virology)
B.S. 1959, University of Maryland; M.S. 1961, Ph.D. 1963, George Washington University

Herbert Rabin, *Head, Radiation Effects Section, Optical Materials Branch, Optical Physics Division, U.S. Naval Research Laboratory*; Solid State Physics
B.S. 1950, University of Wisconsin; M.S. 1951, University of Illinois; Ph.D. 1960, University of Maryland

Marco Rabinovitz, *Research Chemist, National Cancer Institute*; Protein Metabolism
B.A. 1956, Ph.D. 1961, University of California, Berkeley

David Platt Rall, *Associate Scientific Director for Experimental Therapeutics, National Cancer Institute*; Cancer Chemotherapy
B.A. 1946, North Central College; M.S. 1948, M.D., Ph.D. 1951, Northwestern University

Allen Raskin, *Research Psychologist, Psychopharmacology Research Branch, National Institute of Mental Health*; Psychopharmacology
B.A. 1949, Syracuse University; M.S., Ph.D. 1954, University of Illinois

Alvin Richman, *Public Opinion Analyst, Bureau of Public Affairs, Department of State*; International Affairs
B.S. 1957, Massachusetts Institute of Technology; M.I.A. 1959, Columbia University; Ph.D. 1968, University of Pennsylvania

Carl Romney, *Deputy Technical Director, U.S. Air Force Technical Applications Center*; Geophysics
B.S. 1945, California Institute of Technology; Ph.D. 1956, University of California, Berkeley

Jack Rosenbluth, *Associate Professor of Physiology, New York University*; Invertebrate Zoology
B.A. 1952, Columbia University; M.D. 1956, New York University

Philip Russell, *Director, Division of Communicable Disease and Immunology, and Chief, Department of Virus Diseases, Walter Reed Army Institute of Research*; Virology
B.A. 1954, Johns Hopkins University; M.D. 1958, University of Rochester

Padman Sarma, *Head, Ecology and Epizoology Section, Viral Carcinogenesis Branch, National Cancer Institute*; Virology
D.V.M. 1953, Madras Veterinary College, India; M.S. 1957, Ph.D. 1959, University of Minnesota

Leonard Peter Schultz, *Curator of Fishes, Smithsonian Institution*; Vertebrate Zoology (Ichthyology)
B.A. 1924, Albion College; M.S. 1926, University of Michigan; Ph.D. 1932, University of Washington

David Bytovetzski Scott, *Chief, Laboratory of Histology and Pathology, National Institute of Dental Research*; Cytology
B.A. 1939, Brown University; D.D.S. 1943, University of Maryland; M.S. 1944, University of Rochester

Jarvis Edwin Seegmiller, *Clinical Investigator, National Institute of Arthritis, Metabolism, and Digestive Diseases*; Intermediary Metabolism
B.A. 1942, University of Utah; M.D. 1946, University of Chicago

Robert Sumner Sigafoos, *Botanist, U.S. Geological Survey*; Plant Ecology
B.S. 1942, M.S. 1948, Ohio State University; M.A. 1949, Ph.D. 1951, Harvard University

Lyman Bradford Smith, *Senior Botanist, Department of Botany, Smithsonian Institution*; Plant Taxonomy
B.A. 1925, M.A. 1928, Ph.D. 1930, Harvard University

Leon Sokoloff, *Chief, Section on Rheumatic Diseases, Laboratory of Experimental Pathology, National Institute of Arthritis, Metabolism, and Digestive Diseases*; Collagen and Biosynthesis
B.A. 1938, M.D. 1944, New York University

Helmuth Sprinz, *Chief, Department of Experimental Pathology, Walter Reed Army Institute of Research*; Electron Microscopy
M.D. 1936, University of Berlin

Donald Fleming Squires, *Director, Marine Sciences Research Center, State University of New York at Stony Brook*, Biology of Coelenterates
B.A. 1950, Ph.D. 1955, Cornell University; M.A. 1952, University of Kansas

Robert Stern, *Medical Officer, National Cancer Institute*; Cell Biochemistry
B.A. 1957, Harvard University; M.D. 1962, University of Washington

Sarah Stewart, *Medical Director, Human Virus Leukemia Section, National Cancer Institute*; Viral Leukemia
B.S. 1927, New Mexico State University; M.S. 1930, University of Massachusetts; Ph.D. 1939, University of Chicago; M.D. 1949, Georgetown University

Thomas Dale Stewart, *Emeritus Physical Anthropologist, Department of Anthropology, Smithsonian Institution*; Physical Anthropology
B.A. 1927, George Washington University; M.D. 1931, Johns Hopkins University

Keith Larry Storrs, *Political Science (Latin American Government and Politics)*
B.A. 1962, Brigham Young University; Ph.D. 1972, Cornell University

Kenneth Kaname Takemoto, *U.S. Public Health Service Officer, National Institute of Allergy and Infectious Diseases*; Virology
B.S. 1949, M.S. 1950, Ph.D. 1953, George Washington University

John Thomas, *Research Associate, Institute for Behavioral Research*; Experimental Psychology
M.A. 1962, Ph.D. 1965, University of Maryland

Robert Ting, *Scientific Director, Biotech Research Laboratories*; Virology
B.A. 1954, M.A. 1958, Amherst College; Ph.D. 1960, University of Illinois

Anastasios Johannes Tousimis, *Director of Research, Biodynamics Research Corporation, Inc.*; Biophysics
B.S. 1950, M.S. 1952, University of Pittsburgh; Ph.D. 1963, George Washington University

Ernest Umberger, formerly *Chief, Division of Drug Biology, Bureau of Drugs, U.S. Food and Drug Administration*; Endocrine Physiology
B.S. 1937, M.A. 1941, George Washington University; Ph.D. 1948, Georgetown University

Srikrishna Vadlamudi, *Chief, Cancer Chemotherapy Research, Microbiological Associates, Inc.*; Cancer Chemotherapy (Immunology)
M.S. 1959, Ph.D. 1962, University of Wisconsin

John Van Buren, *Acting Chief, Branch of Surgical Neurology, National Institute of Neurological Diseases and Blindness*; Functional Anatomy of the Thalmus
B.A. 1943, Dartmouth College; M.D. 1947, Columbia University; M.S. 1950, McGill University; Ph.D. 1961, George Washington University

Herman Viola, *Director, National Anthropological Archives, Smithsonian Institution*; Anthropology
B.A. 1960, M.A. 1964, Marquette University; Ph.D. 1970, Indiana University

Ludwig von Sallmann, *Chief, Ophthalmology Branch, National Institute of Neurological Diseases and Blindness*; Neuro-ophthalmology
M.D. 1919, University of Vienna

Wilcomb Edward Washburn, *Director, Office of American Studies, Smithsonian Institution*; American Civilization
B.A. 1948, Dartmouth College; Ph.D. 1955, Harvard University

Marion Webster, *Research Biochemist, Laboratory of Experimental Therapeutics, National Heart and Lung Institute*; Metabolism
B.S. 1942, Florida State University; M.S. 1947, Ph.D. 1950, Georgetown University

Herbert Weissbach, *Associate Director and Head of the Department of Biochemistry, Roche Institute of Molecular Biology*; Vitamins
B.S. 1953, City University of New York, City College; M.S. 1955, Ph.D. 1957, George Washington University

Stanley Howard Weitzman, *Curator of Fishes, Smithsonian Institution*; Biological Sciences (Ichthyology)
B.A. 1951, M.A. 1953, University of California, Berkeley; Ph.D. 1960, Stanford University

Myron Lee Wolbarsht, *Professor of Ophthalmology and Physiology, Duke University*; Visual Research
B.A. 1950, St. John's College, Maryland; Ph.D. 1958, Johns Hopkins University

Lorenz Eugene Zimmerman, *Clinical Professor of Ophthalmic Pathology and of Ophthalmology*; Ophthalmic Pathology
B.A. 1943, M.D. 1945, George Washington University

FIELD OF STUDIES CONSULTANTS—GRADUATE SCHOOL OF ARTS AND SCIENCES

Cary Carson, *Coordinator of Research and Architectural Historian, St. Mary's City Commission (Maryland)*; American Civilization (Vernacular Architecture)
B.A. 1963, Carleton College; M.A. 1965, University of Delaware; Ph.D. 1975, Harvard University

Grose Evans, *Curator, Loans and Exhibitions, National Gallery of Art*; American Civilization (English Art History)
B.F.A. 1941, M.A. 1942, Ohio State University; Ph.D. 1953, Johns Hopkins University

Alan Fern, *Chief, Prints and Photographs Division, Library of Congress*; American Civilization (American and European Cinema)
B.A. 1950, M.A. 1954, Ph.D. 1960, University of Chicago

Joseph Fulton, *Specialist in Labor Economics and Relations, Congressional Research Service, Library of Congress*; American Civilization (Labor History)
B.A. 1946, M.A. 1948, New York University

Frederick Richmond Goff, formerly *Chief, Rare Book Division, Reference Department, Library of Congress*; American Civilization (History of Printing and the Book)
B.A. 1937, M.A. 1939, Litt.D. 1965, Brown University

Alan Jabbour, *Director, Folk Arts Division, National Endowment for the Arts*; American Civilization (Folk Music)
B.A. 1963, University of Miami; M.A. 1966, Ph.D. 1968, Duke University

John Bennett Kuiper, *Head, Motion Picture Section, Division, Prints and Photographs, Library of Congress*; American Civilization (Mass Media: Movies and Television)
B.A. 1950, University of Kentucky; M.A. 1957, Ph.D. 1960, University of Iowa

Vernon McKay, *Professor of African Studies, School for Advanced International Studies, Johns Hopkins University*; African History
B.A. 1933, Baker University; M.A. 1934, Syracuse University; Ph.D. 1939, Cornell University

Julian Wood Witherell, *Head, African Section, Library of Congress*; American Civilization (African History)
B.A. 1956, Bowdoin College; M.A. 1958, Ph.D. 1964, University of Wisconsin

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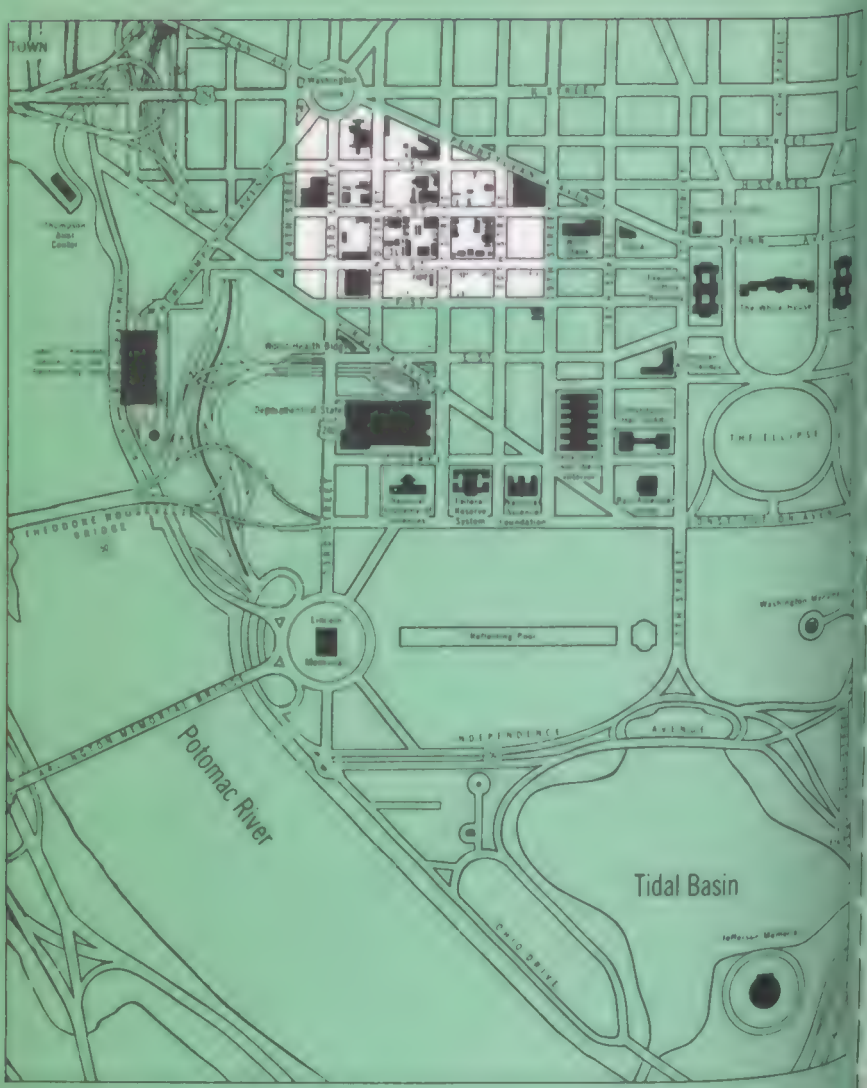
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December, 1977



SCHOOL OF MEDICINE AND HEALTH SCIENCES BULLETIN

1977-1978



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August 26	Orientation, *Friday*
August 29	Registration, *Monday*
August 30	First day of classes, *Tuesday*
September 5	Labor Day (holiday) for first- and second-year students, *Monday*
November 23	Thanksgiving vacation begins after classes for first- and second-year students, *Wednesday*
November 28	Return from vacation, *Monday*
December 16	Winter vacation begins after classes, *Friday*
January 2	Classes resume, *Monday*
January 10	Spring Registration, *Tuesday*
February 20	Washington's Birthday (holiday) for first- and second-year students, *Monday*
March 24	Spring break begins after classes for first- and second-year students, *Friday*
April 3	Return to classes, *Monday*
April 21	Spring break begins for third-year students at 5:00 p.m., *Friday*
May 1	Third-year students begin clerkship, *Monday*
May 19	Last day of classes, *Friday*
May 26	Commencement, *Friday*

* This Calendar is subject to change. Although registration is conducted in both September and January, there is no precise date for the end of the fall semester; some courses end before the winter recess while others begin before the January registration. See the *School of Medicine Schedule of Classes* for exact time of course offerings.

THE UNIVERSITY

HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period,

the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. Within a few blocks are the White House, the Department of the Interior, the State Department, the World Bank, and many other governmental offices and international agencies. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education, Government and Business Administration, and Public and International Affairs; the College of General Studies; the Division of University Students; the Division of Experimental Programs; and the Summer Sessions.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an ex officio member.

ACADEMIC STATUS

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board. The Department of Chemistry is on the approved list of the American Chemical Society.

The School of Medicine and Health Sciences has had continuous approval by the Council on Medical Education of the American Medical Association and the Association of American Medical Colleges. The Doctor of Medicine degree of the School of Medicine and Health Sciences is recognized by all state and territorial medical licensure boards in the United States.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of sex, race, color, religion, national origin, or handicap in any of its education programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973 call for an explicit statement that the requirement not to discriminate on the basis of sex or handicap extends to employment in and admission to such programs and activities.

Inquiries concerning the application of this policy and federal laws and regu-

lations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office for Civil Rights of the Department of Health, Education, and Welfare.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board; the Departments of Drama, Dance, and Music; and other student and faculty organizations.

The Center Governing Board, representative of all elements of the University community, plays an important role in the day-to-day functioning of the center. This board works closely with the full-time staff in the development of procedures and policies which provide a framework for the center's operation.

RECREATION

The nation's capital provides abundant recreational resources, a large number of which are available at little or no cost. There are numerous art galleries, museums, concert halls, theaters, swimming pools, parks, and places of great historic interest. Social activities are provided by student organizations of the University, the School of Medicine and Health Sciences, and University-sponsored programs such as intramural sports, concerts, recitals, and dramatic productions. Religious faiths are well-represented in the Washington metropolitan area. Washington is one of the most colorful cultural and scientific centers of the world.

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THE SCHOOL OF MEDICINE AND HEALTH SCIENCES

OFFICERS OF ADMINISTRATION OF THE MEDICAL CENTER

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Office of Academic Affairs

The Office of Academic Affairs bears the responsibility for the curriculum; student affairs, including scholarship and financial aid; research and sponsored programs; allied health programs; educational evaluation; admissions; and support services of the library and audio-visual and animal facilities.

Lawrence Thompson Bowles, M.D., Ph.D., *Dean for Academic Affairs*
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Robert Keimowitz, M.S., M.D., *Associate Dean for Student Affairs and Admissions*
Winfield Harker Scott, Ph.D., *Assistant Dean for Education and Director of Education*

Office of Administrative Affairs

The Office of Administrative Affairs is responsible for the administration of the University Hospital and Clinic, for support services to the School of Medicine and Health Sciences, and for the financial management of the Medical Center.

Philip Stanley Birnbaum, M.S. in M.E., B.C.E., *Dean for Administrative Affairs*
Thomas James Carroll, B.A., *Director of Financial Services*
Bruce Johnson Dietz, B.A., M.S., *Director of Management Information*
Donald Chester Novak, B.S., M.B.A., *Administrator of the Medical Center*

Office of Clinical Affairs

The Office of Clinical Affairs is responsible for the patient care activities of the University Hospital and Clinic and for the supervision of the graduate and continuing medical education programs and community affiliation programs.

Dennis Sophian O'Leary, B.A., M.D., *Dean for Clinical Affairs*
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HISTORY

The School of Medicine and Health Sciences of George Washington University has a distinguished history that goes back more than a century. In March, 1825, the School opened with the intention of building "a medical school commensurate with the progress and demands of a rising metropolis, and the improvement of service throughout the country." The School, the eleventh oldest medical school in the country, has met this responsibility by providing its students with a foundation in the medical sciences upon which they have built medical careers in practice, teaching, research, or administration.

In 1844 the School took on a new dimension when Congress granted it the use of the Washington Infirmary. Thus one of the earliest general teaching hospitals in the nation was established in Washington.

The distinguished history of the George Washington University School of Medicine and Health Sciences closely parallels academic advances and medical progress of the nation. The School has contributed to both.

The George Washington University Medical Center, established in 1966, consists of Walter G. Ross Hall, which houses the School of Medicine and Health Sciences; the Paul Himmelfarb Health Sciences Library; the University Hospital; the H.B. Burns Memorial Building, which houses the Medical Faculty Associates (the University Clinic); the Helen L. and Mary E. Warwick Memorial Building; and affiliated hospitals.

In 1973, with the introduction of undergraduate programs in Allied Health Sciences, the name of the School was officially changed from the School of Medicine to the School of Medicine and Health Sciences.



Regulations

A student enrolled in the University is required to conform to the following regulations and to comply with the rules and regulations of the college, school, or division in which he or she is registered.

A student who withdraws or is suspended, or is otherwise absent from the University for one semester or more, may re-enter and continue scholastic work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be cancelled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the Faculty) for subsequent registration in the University.

Academic Dishonesty

The University community, to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and are held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper university channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of Federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate; and
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Personally identifiable information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency.
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying this student of the action.

The University will release the following directory information upon request: address; telephone number; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; and honors received. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

University guidelines on the release of student information may be obtained from the Office of the Registrar.

Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

Right to Change Rules

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules and fees. Such regulations shall go into force whenever the proper authorities may determine.

Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

Student Conduct

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

University Policy on Drugs

The University cannot condone violations of law, including violation of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

The Libraries

Students have the privilege of using the University Library and the School of Medicine and Health Sciences Library. The stacks are open, and all students

are welcome to browse at their leisure. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

All students using the libraries are expected to be familiar with the regulations governing their use, which are available at each library.

Property Responsibility

The University is not responsible for the loss of personal property. A "Lost and Found" Office is maintained on campus in the Safety and Security Office.

Student Affairs

The Office of the Vice President for Student Affairs develops student life programs, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Students, Student Activities, Student and Alumni Career Services and Student Health Service. More detailed information on these and other activities is contained in the *Student Handbook*.

Student Health Service

The Student Health Service is an outpatient clinic designed to assist students registered on campus with their health needs. It is located at 935 22nd St., N.W. (in the H.B. Burns Memorial Building).

Physicians and physician assistants are available by appointment from 9 a.m. to 4:45 p.m., Monday through Friday. In addition, physician assistants are available for emergency care to walk-in patients Monday through Friday from 5 to 6:45 p.m. and on Saturday from 9 a.m. to 12 noon.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. A student who is not currently enrolled or who has severed connection with the University is ineligible for medical benefits of the Student Health Service. Any student who so desires may engage physicians and nurses of his or her own choice, but the student will be responsible for all the fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratories and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The Student Health Service has arranged for and endorsed group health and accident insurance, on an elective basis, for those full-time students who do not have other coverage. Students are encouraged to carry adequate health insur-

ance coverage for themselves and, if married, for their spouses and children. Interested students should contact the Student Health Service Office.

Residence Halls

Complete information concerning the University's residence halls is available from the Director of Housing, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing may be obtained at this Office and at the Office of the Dean for Academic Affairs. Reservations for private housing must be made by students.

Munson Hall Apartments

Munson Hall is a University-owned and operated apartment house containing 15 one-bedroom and 54 efficiency apartments. Graduate and married students are eligible to reside in Munson Hall. Those wishing to apply for an apartment should contact the Housing Office for a waiting list application. All leases are for 12 months.

Housing for Undergraduate Allied Health Students

Admission to the University does not include a room reservation. The student will receive, with notification of acceptance, University residence hall information, an application for residence hall space and a declaration of intent to attend the University. The application for residence hall space must be accompanied by a $100 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room charge. Rooms are leased for the academic year, September to May, and lease payment must be made by June 30 for the fall semester. Physician assistant and nurse practitioner applicants are not encouraged to apply for University housing in view of their extended academic year.

1977–78 RESIDENCE HALL RATES PER PERSON FOR TWO SEMESTERS*

For Men:	
Calhoun Hall	
double room	$1,126
triple room	1,074
For Women:	
Strong Hall	
single room	1,174
double room	1,126
triple room	1,050
For Men and Women:	
Crawford Hall (limited to sophomores, juniors and seniors)—double room	1,126
Francis Scott Key Hall (limited to juniors and seniors):	
apartment for two persons	1,200
apartment for three persons	1,200 or 1,150

*Residence hall prices and allocation subject to change.

Mitchell Hall (limited to sophomores, juniors and seniors)—single room	1,200
Madison Hall	
double room	1,126
triple room	1,050
Thurston Hall	
double room, triple room, large room for four	1,126
suite for six	1,050

FOOD SERVICE*

Resident allied health students in the freshman and sophomore years are required to participate in the food service plan. Freshmen must participate in the seven-day, 19 meals per week plan, at the rate of $830 for the academic year. Sophomores may elect either the 19-meal plan or an any 14 meals per week plan for $780 for the academic year. Each plan, plus an additional "any 10 meals" per week plan at $652 for the academic year, is optional for allied health juniors and seniors, and for medical students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to the dining rooms in Thurston and Mitchell Halls and the second floor contract dining room in the Cloyd Heck Marvin Center.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Veterans Education

The veterans counselor in the Office of the Registrar, Luther Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as veterans, widows, or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration, and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., Washington, D.C. 20421.

Facilities

Walter G. Ross Hall

Walter G. Ross Hall was dedicated and opened in May, 1973. This modern facility provides the teaching and laboratory facilities for students in the School

* Food service prices subject to change.

of Medicine and Health Sciences. It occupies a city block of Washington on the northwest edge of the University campus, and its gross area is approximately 550,000 square feet, more than 10 acres. The building is equipped with modern audiovisual and other teaching equipment as well as basic science laboratories.

Office of Education

The Office of Education comprises a group of core facilities and services supportive of the educational, clinical and research missions of the Medical Center. Coordinated through the Assistant Dean for Education, the four divisions of the Office of Education are the Office of Audiovisual Education, the Office of Computer-Assisted Education, the Division for Evaluational Services and the Paul Himmelfarb Health Sciences Library.

The Office of Audiovisual Education and Services, Frank Allen, Ph.D., Director.—This office aims to enhance learning in the Medical Center with audiovisual technology. Consultation is provided in the use of nonprint media



in educational, clinical and research programs. The office provides displays of audiovisual materials and programs in classrooms, in the Audiovisual Study Center of the Himmelfarb Library and throughout the Medical Center. It has highly developed production capabilities which are available to students and faculty. They include photographic, illustration, cinematographic and television studios, and a print shop which serve the Medical Center community. Virtually all learning spaces at the Medical Center are equipped for still and motion projection and television display. Those spaces subject to frequent use are equipped with permanent systems for projection, sound amplification and recording designed to support staff and student presentations.

Computer-Assisted Education and Services, Charles Tidball, M.D., Ph.D., Director.—This office provides training in computer literacy and delivery of computer-based learning materials. Other services include scoring of examinations, maintenance of academic records, computing in support of research projects, data acquisition, statistical analysis and text processing. The office maintains hardware and software support for computer-based learning material developed by faculty and students of the Medical Center. It functions as an interface for the delivery of material from other computer-assisted educational programs—notably Massachusetts General Hospital and Ohio State University—through the Health Educational Network, Inc. Cooperative programs with the National Institutes of Health and the National Library of Medicine provide access to additional computerized data bases.

Division for Evaluational Services, Winfield Scott, Ph.D., Director.—The primary task of this division is to work with faculty and students toward the improvement of educational programs. It provides consultation to faculty in support of efforts to maximize opportunities for learning. It conducts evaluations of courses and other curriculum components and works toward the establishment of effective systems for evaluating student performance.

Paul Himmelfarb Health Sciences Library, Nina W. Matheson, Director.—Located adjacent to Ross Hall, the Paul Himmelfarb Health Sciences Library provides 30,000 square feet to house a capacity of 80,000 volumes. Seating is available to approximately 400 users. Space available includes smoking lounges, group study rooms, audiovisual viewing rooms, a typing room and individual study carrels. The Audiovisual Study Center is equipped with the most recent and up-to-date resources and facilities, including videotape monitors, terminals for accessing computer-aided instructional programs, slide-tape recorders and rear-view slide projection units. The collection of more than 60,000 volumes and 1,400 journal subscriptions is enhanced by extensive non-print audiovisual media which are both commercially and locally produced. Together these provide the foundation for the delivery of a number of special information services. The Network for Continuing Medical Education program provides loans of videotapes to individuals who cannot attend the regularly scheduled viewings. As a designated National Library of Medicine Medline Center, the library offers computer-based bibliographic research services such as Medline, Toxline and Cancerline. Staff may request monthly selective dissemination of information searches from this data base. Search capability on other data bases such as Science Citation Index, Psychological Abstracts and Biological Abstracts are being implemented. Materials not available in its own collection will be borrowed to meet user needs.

Through both formal and informal means, the library staff instructs its clientele on the effective use of materials and services. An active participant

in the National Library of Medicine's Regional Library Communications Network, the library is involved in regional planning and policy making.

The George Washington University Hospital

This 550-bed hospital, including the Eugene Meyer Pavilion, and the Andrew Duncan Pavilion is adjacent to the School of Medicine and Health Sciences. It is the primary clinical teaching facility for the students and for a large house staff. It is fully approved and accredited by the American Medical Association, the American Hospital Association, the American College of Physicians, and the American College of Surgeons, through the Joint Commission for the Accreditation of Hospitals. Annual patient admissions number approximately 20,000.

The Watson Wise Emergency Pavilion of the hospital logs approximately 40,000 patient visits annually and is one of the city's most active emergency units.

The University Hospital is equipped to serve 16 specialty fields. Complex teamwork procedures such as renal dialysis, a computerized x-ray unit for diagnosing brain diseases, cardiac catheterization, open-heart surgery, transplant surgery, and total hip replacements are included in its activities. Facilities include a surgical suite of 10 rooms, two of which are equipped with overhead galleries where observers may communicate with the surgical teams, observe the electronic patient-monitoring system in action, and view the intricate surgical procedures below.

The Helen L. and Mary E. Warwick Memorial Building

This building houses a computerized multitest facility that is available to physicians for patient evaluation.

The Medical Faculty Associates (The University Clinic)

The Clinic is housed in the 13-story H.B. Burns Memorial Building, where ambulatory care is consolidated and integrated within the teaching program. The academic group practice of physicians in general medicine and more than 20 specialists is based in the Burns Building. Visits of ambulatory patients number approximately 90,000 annually.

Affiliated Hospitals

Children's Hospital National Medical Center.—Children's, one of the finest pediatric health care centers in the country, houses 220 inpatient beds, including a specialized referral intensive care nursery and an adolescent unit. Its ambulatory Diagnostic and Treatment Center handles in excess of 120,000 visits a year. Children's is the major base for the School of Medicine and Health Science's Department of Child Health and Development, and for the assigned pediatric clerkship. A variety of elective opportunities are offered in various aspects of child health.

Columbia Hospital for Women.—This hospital, situated two blocks from the University Hospital, is utilized by medical students for training in obstetrics and

gynecology. Columbia Hospital for Women is an affiliated hospital for residency training in Obstetrics and Gynecology in the George Washington University Medical Center Program.

Fairfax Hospital.—This 530-bed voluntary community teaching hospital serves a burgeoning surburban area and provides all clinical services including psychiatry. Each year more than 20,600 patients are admitted, 4,900 babies delivered, 15,000 surgical operations performed, and 49,200 persons examined and treated in the Emergency Suite. Fairfax Hospital offers a rotating internship program, a School of Medical Technology, and clinical facilities for a School of Practical Nursing. Students of the School of Medicine and Health Sciences serve at this hospital in clinical clerkship and elective programs. Fairfax Hospital is an affiliated hospital for residency training in Obstetrics and Gynecology in the George Washington University Medical Center Program.

Holy Cross Hospital.—Holy Cross, a modern 338-bed hospital, is a primary clinical campus which provides students with first-hand exposure to the practice of medicine in the community. It is a private, voluntary facility in which the full range of medical, surgical, and pediatric services are provided for a growing suburban population. Last year, more than 19,000 patients were hospitalized, nearly 47,000 emergency visits were registered, and 3,263 babies were delivered at Holy Cross. The hospital, which has consistently experienced one of the highest occupancy rates in the Washington metropolitan area, is planning an expansion to include an additional 112 beds, enlarged emergency room facilities, and a new, self-contained center for in-and-out surgery.

National Naval Medical Center.—The Naval Hospital at the National Naval Medical Center, Bethesda, Md., is a 750-bed general hospital offering a wide range of specialized services, clinical research, and educational programs. Medical care is provided to active duty and retired military members and their dependents. It is a major referral center for thoracic and cardiovascular surgery as well as for cancer therapy. The teaching staff directs a complete internship and residency program in 21 specialties.

St. Elizabeths Hospital.—St. Elizabeths Hospital, established by an act of Congress in 1855, is a federal psychiatric hospital administered under the Department of Health, Education, and Welfare. This hospital provides for the treatment, care, and general well-being of approximately 6,000 patients of whom 3,400 are resident. The facility includes a completely approved General Hospital to meet the needs for medical and surgical care and functions with a full-time staff within the hospital plus attending physicians in various specialties. The hospital maintains an up-to-date medical library.

Medical students of George Washington University utilize the facilities of St. Elizabeths for clinical psychiatric training. Opportunities for research are enhanced by a cooperative arrangement with the National Institute of Mental Health of the United States Public Health Service.

Veterans Administration Hospital.—In addition to the medical, surgical, psychiatric, neurological, tubercular, and physical medicine and rehabilitation services, this 700-bed hospital has a large outpatient program; an extensive medical research program; programs in open heart surgery, cobalt therapy, and renal dialysis; a metabolic program; and a specially designed Administrative Research Laboratory.

Washington Hospital Center.—This 843-bed private, voluntary institution serves the greater Washington area through a triad of activities: patient care, teaching, and research. The Center is the tenth busiest of more than 7,000

hospitals in the United States and the second busiest private hospital in terms of inpatient admissions. A very active emergency service cares for more than 49,000 patients a year, and the 50 clinics provide all major clinical service except pediatrics for about 65,400 outpatients and 31,700 inpatients yearly. In addition to an extensive approved internship and residency program, the Center offers organized instruction for nurses, laboratory and x-ray technicians, medical secretaries, and other health-related vocations.

Committees

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H.C. Pierpont *(Chairman)*, A. Baer, H.L. Feffer, N.C. Kramer, R.A. Levine, J.T. Quattlebaum and M.L. Robbins

ADMISSIONS AND ADVANCE STANDING

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ALLIED HEALTH PROGRAMS

S.D. Rockoff *(Chairman)*, M. Anderson *(Medical Technology Program student)*, C.U. Battle, P.S. Birnbaum, L.T. Bowles *(ex officio)* J.A. Frank, Jr., S.S. Hammersberg, D.B. Jenkins, P. Jones *(Physician's Assistant Program student)*, K.R. Katterjohn, J. Kleh, S.C. Marinoff, P. Mazel, M. McCally, J.W. Millar, U.E. Ruttimann, I.G. Tamagna and D.W. Watkins

APPOINTMENTS, PROMOTION AND TENURE

R.H. Parrott *(Chairman)*, F.P. Abramson, R.A. Kenney, A.M. Lewicki, H.V. Rizzoli, P.E. Shorb, Jr. and H.M. Silver

BYLAWS

R.A. Kenney *(Chairman)*, B.S. Dunbar, R. Hugh, B. Nelson, A.E. Parrish and W.S. Yamamoto *(ex officio)*

COMMUNICATIONS AND EDUCATIONAL RESOURCES

R.S. Snell *(Chairman)*, Y. Al-Doory, F.D. Allan, L.T. Bowles *(ex officio)*, K.R. Katterjohn, N.W. Matheson, H.C. Miller, Jr., R.H. Parrott, M.L. Robbins, C.S. Tidball, J.M. Schulman *(student body)*, W.H. Scott, J. Silidker *(student body)*, R.J. VanHouten, E. Waters, Jr. and W.S. Yamamoto

CONTINUING MEDICAL EDUCATION

K. Wipplinger *(Chairman)*, C.T. Bever, W.H. Cooper, J.A. Curtin, T.E. Curtin, M. Feitel, W.J. Fouty, V.M. Iovine, A.M. Margileth, W. Marsh, A.M. Mondzac, S. Nussbaum, D.S. O'Leary *(ex officio)*, J.J. Rheingold, W.H. Scott, J.R. Shapiro, M.H. Stolar, E.W. Sutherland III, R.J. VanHouten, S.G. Werner and R.S. Wilkinson

EDUCATIONAL EVALUATION

F.N. Miller *(Chairman)*, E. Baehler *(1st-year medical student)*, L.T. Bowles *(ex officio)*, G.J. Cohen, B.B. Doyle, J.B. Erdmann, S.S. Haas, D. Frank *(3rd-year medical student)*, V.M. Iovine, R.M. Kaufman, R.I. Keimowitz, P. Klubes, J. Lindsay, Jr., M. Neill *(4th-year medical student)*, D.S. O'Leary, B.H. Ong, T.E. Piemme, C.B. Robinowitz, S.J. Scott, Jr., W.H. Scott, B.W. Smith, K. Spencer *(2nd-year medical student)* and K.S. Weston

EDUCATIONAL PLANNING

L.L. Lessin *(Chairman)*, L.F. Affronti, F.D. Allan, G.B. Avery, P.S. Birnbaum, L.T. Bowles *(ex officio)*, A. Breslow, R. Byers *(3rd-year medical student)*, J.W. Canter, M.M. Cassidy, O.W. Donnelly, J.B. Erdmann, M. Enders, B.E. Filner, B. Fine *(1st-year medical student)*, M.J. Halberstam, J. Jacobson *(4th-year medical student)*, H. Jason, R.I. Keimowitz, P.I. Kenmore, L.G. Pawlson, D. Reiss, W.H. Scott, H.S. Semerdjian, R.S. Snell, B. Snyder *(2nd-year medical student)*, J.A. Straw, N.T. Tsangaris, G.V. Vahouny, B. Waxman, T.G. Webster, A.C. Wyman and W.S. Yamamoto

EXECUTIVE COMMITTEE OF THE MEDICAL CENTER FACULTY SENATE

J.P. Adams *(Chairman)*, V.M. Iovine, R.P. Kaufman *(ex officio)*, R.A. Kenney, F.N. Miller and A.B. Weingold

GRADUATE MEDICAL EDUCATION

H.D. Weintraub *(Chairman)*, B.J. Arling, M.F. Armaly, J.D. Berryman, P.E. Chanel, D.W. Delaney, D. Ein, M.L. Elgart, F.S. Jannotta, R.I. Keimowitz, A.I. Kobrine, S.D. Macht, H.G. Mandel, H.C. Miller, Jr., G.F. Molinari, R.J. Neviaser, D.S. O'Leary *(ex officio)*, T.E. Piemme, M. Parker, W.H. Scott, P.E. Shorb, Jr., R.J. VanHouten, J.A. Willis *(medical student body)* and A.C. Wyman

LONG RANGE PLANNING

M.L. Elgart *(Chairman)*, J.M. Bailey, P.S. Birnbaum *(ex officio)*, L.T. Bowles *(ex officio)*, R.P. Kaufman *(ex officio)*, S.L. Leikin, S.D. Loube, W. Newman, D.S. O'Leary *(ex officio)*, J.N. Sheagren and L.W. Thompson

MEDICAL SCIENCES GRADUATE PROGRAMS

V.H. Cohn, Jr. *(Chairman)*, L.F. Affronti, L.T. Bowles *(ex officio)*, C. Bisgaier *(Biochemistry student)*, M.M. Cassidy, A.C. Hollinshead, J.B. Levy, D.E. Morse, S.O. Schiff, M. Skelly *(Pharmacology student)*, H. Solomon *(ex officio)*, C.R. Treadwell, P. Vestal *(Microbiology student)* and B.C. Zook

PUBLIC RELATIONS

H.C. Miller, Jr. *(Chairman)*, P.S. Birnbaum *(ex officio)*, L.L. Gallo, P. Hurley, H.G. Mandel, M.A. Newman and J.N. Sheagren

RESEARCH

D.R. Smith *(Chairman)*, E.N. Albert, L.T. Bowles *(ex officio)*, P.J. Chopivsky *(Beaumont Society student)*, D.O. Davis, G.S. Edwards, D. Ein, G.W. Heelhoed, A.L. Ginsberg, M.J. Jackson, G.S. Kent, J.W. Larsen, Jr., F. Leonard, S. O'Reilly, A.E. Parrish, H.V. Pipberger, M. Reich, M.J. Stern, C.R. Treadwell and B.C. Zook

SPACE AND FACILITIES

G.V. Vahouny *(Chairman)*, E.N. Albert, P.S. Birnbaum *(ex officio)* L.T. Bowles *(ex officio)*, M.D. Brenner *(4th-year medical student)*, J.B. Cohen *(3rd-year medical student)*, W.O. Dobbins III, M. Frank, H.C. Harder, S.G. Kent, R.I. Keimowitz, P.D. Kind, F. Leonard, R. Libby *(2nd-year medical student)*, R. Randazzo *(1st-year medical student)* and S.D. Rockoff

STUDENT AFFAIRS

J.J. Katzow *(Chairman)*, H.H. Ammerman, P. Basch *(3rd-year class president)*, L.T. Bowles *(ex officio)*, M. Fuchs, L.L. Gallo, M. Gusack, R.I. Keimowitz, R.J. Maunder *(4th-year class president)*, M. McCally, J.E. McClenathan, F.N. Miller, Y.C. Oertel, W.H. Scott, J. Shapiro *(1st-year class president)*, A.M.S. Thompson, J. Williams *(2nd-year class president)* and J.M. Wise

Alumni and Allied Associations

THE GENERAL ALUMNI ASSOCIATION

The objectives of this association are to unite graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have matriculated in any school of the University and left the University in good standing, or any person who is or has

been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those eligible members who are current contributors (dues or otherwise) to or life members of the George Washington University General Alumni Association, the Alumni Association of any school of the University, or contributors to the Annual Support Program.

The Alumni Office is in Alumni House, 714 Twenty-first Street, N.W., Washington, D.C. 20052. All alumni are urged to keep the Alumni Office informed of changes of address or occupation and to supply information with regard to their fellow alumni.

THE GEORGE WASHINGTON UNIVERSITY MEDICAL ALUMNI ASSOCIATION

The George Washington University Medical Alumni Association, incorporated in 1959, continues the organization previously known as the George Washington University Medical Society.

The stated purposes of the Association are as follows: "This shall be a nonprofit organization international in scope, whose objectives shall be to provide constructive services for the M.D. degree alumni of the George Washington University School of Medicine and Health Sciences for furthering the art and science of medicine, research, and for the promotion of the welfare of the George Washington University School of Medicine and Health Sciences, its students, the George Washington University Hospital and its trainees."

Active membership in the Association consists of all M.D. degree graduates of the School of Medicine and Health Sciences; current members and, on application, past members of the teaching staff of the School of Medicine and Health Sciences, who hold doctoral degrees; doctors of medicine who have had one or more years of postgraduate training in the George Washington University Hospital. Junior membership consists of all members of the student body of the M.D. degree program of the School of Medicine and Health Sciences.

The Medical Alumni Association maintains an office in the School of Medicine and Health Sciences.

Officers for 1976–77

President—John F. Mermel, M.D. 1960
President Elect—Dee Parkinson, M.D. 1943
First Vice President—Sidney Levine, M.D. 1941
Second Vice President—William Stuart Battle, M.D. 1967
Secretary—Harry Beaver, M.D. 1963
Treasurer—William Thompson, M.D. 1967
Council:

Harvey Ammerman, M.D. 1943
James P. Burns, Jr., M.D. 1949
Marvin Footer, B.A. 1938, M.D. 1942
Donald Glew, Jr., M.D. 1948
Thomas Goodridge, M.D. 1965
Stanley Kirson, B.A., M.D. 1957
Samuel Loube, B.A. 1941, M.D. 1943

John Lyles, M.D. 1970
Alvin Parrish, M.D. 1945
Gordon Smith, M.D. 1943



THE DOCTOR OF MEDICINE DEGREE PROGRAM

ADMISSION

The George Washington University School of Medicine and Health Sciences seeks to enroll intellectually gifted, humanly sensitive, mature persons who will excel in the science and art of medicine. Applicants of diverse social and educational backgrounds have access to the admissions process. In the selection process there is no discrimination because of sex, race, color, religion, or national or regional origin.

Entrance Requirements

ADMISSION TO THE FIRST-YEAR CLASS

For admission to the Doctor of Medicine degree program, a minimum of 90 semester hours must have been earned in an accredited American or Canadian institution of higher learning. Credits earned in a professional school can be applied to the fulfillment of this minimum requirement only if they are acceptable by the applicant's college or university toward a bachelor's degree in arts or science. (A credit under the quarter system is two-thirds of a semester hour.) It is advantageous to complete four full years of undergraduate study. Only exceptional students are accepted upon completion of the minimal requirements.

It is possible for exceptional students with three years of undergraduate work in Columbian College of George Washington University to be admitted to this medical school and to receive a combined Bachelor of Arts-Doctor of Medicine degree. More detailed information on this program is given on page 31.

The following courses must be completed with satisfactory achievement before the applicant can be certified for matriculation. All required science courses must include sufficient laboratory work to give assurance of familiarity with the experimental methods and techniques of the disciplines.

1. **Biology:** Eight semester hours, including two semester hours of laboratory. This may be either in general biology or zoology, but may *not* include separately credited courses in botany.

2. **Chemistry:** Eight semester hours of general inorganic chemistry (which may include qualitative analysis), including two semester hours of laboratory; six to eight semester hours of organic chemistry, including laboratory.

3. **Physics:** Eight semester hours, including at least two semester hours of laboratory.

4. **English:** Six semester hours in composition and literature. This may be the usual introductory college course or its equivalent.

The number of required courses has been kept to a minimum in order to allow college students the time to pursue their own interests in depth. The Admissions Committee has no preference with regard to the major area of study of the applicant. Students with backgrounds in the arts, humanities, and social sciences are as admissible as applicants with science backgrounds. The Committee does expect that work in the student's chosen area of concentration as well as in the required science courses should reflect scholarly interests and show evidence of significant achievement.

ADMISSION WITH ADVANCED STANDING

General Requirements.—Advanced standing application can be made for transfer into the second or third year programs. No applications will be accepted for the fourth year program. The applicant must be or have been registered in an accredited school of medicine. He or she must be in good standing and eligible to continue in the school where currently enrolled or eligible to re-enter the former medical school if his or her education has been interrupted.

All applicants, except those presently enrolled in Doctor of Medicine degree programs in U.S. or Canadian medical schools, are required to achieve a score of 380 or better on each relevant subsection of the National Board of Medical Examiners test. American students enrolled in foreign medical schools must apply to take this test under the auspices of the Coordinated Transfer System (COTRANS) of the Association of American Medical Colleges. Applicants not enrolled in U.S. or foreign Doctor of Medicine degree programs can petition the Office of Admissions for sponsorship for the National Board of Medical Examiners test. This petition must be received no later than March 1, 1978.

Requirements for Admission to the Second Year.—The applicant must have completed a course of study at least equivalent to that required of medical students at this University for advancement to the second year. Course work in anatomy, biochemistry, microbiology and physiology must have been completed at an accredited medical school. Applicants who are not matriculated at a U.S. or Canadian medical school must pass the National Board of Medical Examiners subtests in these areas. It is also advisable that the applicant have experience in or knowledge of normal psychological development, epidemiology and statistics.

Requirements for Admission to the Third Year.—The applicant must have completed a course of study at least equivalent to that required of medical students at this University for advancement to the third year. Course work in anatomy, biochemistry, microbiology, physiology, pharmacology, pathology, physical diagnosis and clinical assessment must have been completed at an accredited medical school. The applicant must score above 380 on each of the subtests included on the Part I examination given by the National Board of Medical Examiners. Applicants should have completed a course of study similar in content to the interdisciplinary clinical sciences program required of second-year medical students at this University (see page 30). This program

consists of four courses, Idis 201, Path 201, Phar 201 and Pchi 201, and covers didactic work in varying clinical medicine areas and practical work in clinical evaluation of patients.

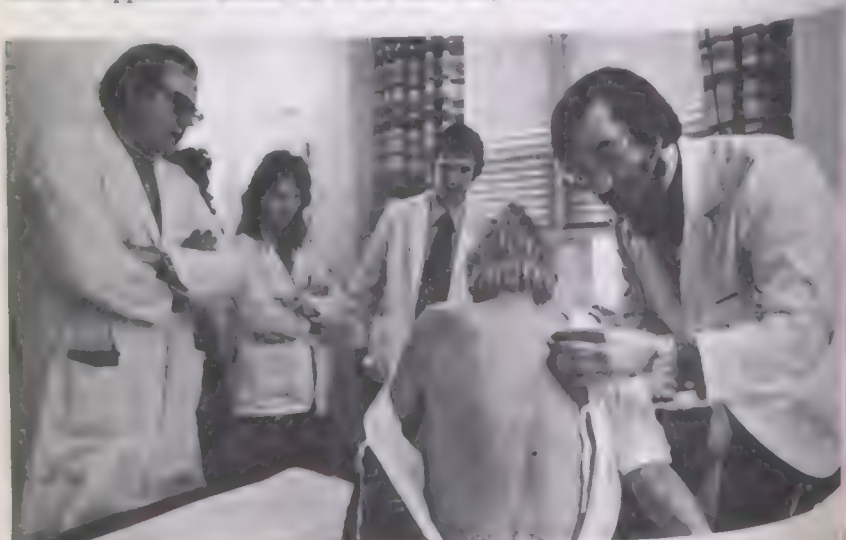
Application Procedure

APPLICATION TO THE FIRST-YEAR CLASS

The School is a participant in the American Medical College Application Service (AMCAS). Applications for a place in the first-year class can be obtained only from AMCAS, 1776 Massachusetts Avenue, N.W., Suite 301, Washington, D.C. 20036. When completed, this application is returned to AMCAS for distribution to schools selected by the applicant. The AMCAS application deadline is November 15, 1977.

After receipt of our copy of the AMCAS application, the Office of Admissions will send applicants a Supplemental Application. This requests information not included on the AMCAS application. Submission of this supplemental application (due no later than December 31, 1977), including the nonrefundable supplemental application fee ($25), will initiate Admissions Committee processing of the application. On the basis of the available information some applicants will be asked to have letters of evaluation (recommendation) sent. After careful review of these documents the committee will extend an invitation for interview to the most promising candidates. When these steps are completed, the application will be brought to the Admissions Committee for final decision. Applicants will be informed of final decisions immediately. Although it does not assume an obligation to report missing or erroneous credentials, the Admissions Office will try to contact the applicant if it is noted that necessary credentials are missing.

This institution also participates in the AMCAS Early Decision Program. Interested applicants for the 1978–79 entering class are referred to the AMCAS "Information Booklet" included with the AMCAS application materials. Early decision applicants should be aware that they must submit their application by



August, 1977, and that for consideration, the supplemental application and all letters of recommendation and transcripts must be received by the Office of Admissions no later than September 1, 1977. Decisions on early decision candidates are made usually by October 1 and no later than October 15.

Applicants are referred to the AMCAS "Information Booklet for the 1978–79 Entering Class" and to the admissions brochure prepared specifically for applicants and available from the Office of Admissions for the most up-to-date information available at the time of application. Details included in those sources supersede information contained herein.

APPLICATION WITH ADVANCED STANDING

Applications for admission with advanced standing should be obtained from the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, 2300 Eye Street, N.W., Washington, D.C. 20037.

All applicants must complete an advanced standing application form and submit it with a $25 application fee no later than June 1, 1978.

The dean of the school in which the applicant is enrolled must submit a letter of recommendation stating that the applicant is eligible to continue in that school, the reasons for transfer and an overall evaluation of the student. Letters of recommendation are also required from a member of the school's basic science faculty and from either a member of a different basic science department or from someone who is personally aware of those characteristics of which the applicant wishes the Admissions Committee to be aware.

Official transcripts of the applicant's record must be sent from each institution attended since high school. Students enrolled in foreign medical schools must include certified copies and a translation of their medical school records with their applications.

Applicants who are accepted must have final official transcripts sent to this University prior to matriculation here.

The most recent application information will be made available at the time an applicant requests the application. That information will supersede information contained herein.

Selection Procedures

To process the vast number of applications to this institution fairly and expeditiously, a screening evaluation system is utilized. This evaluation procedure screens applicants on the basis of undergraduate grades (taking into account improvement in performance in later years), Medical College Admission Test scores, and pertinent extracurricular and work experiences. Some additional consideration is given to applicants from the District of Columbia and the neighboring metropolitan area, as well as to applicants from George Washington University. Although there are no age limits, the very young and relatively older applicants must demonstrate considerable strength in other aspects of their applications.

When all credentials and interview reports are available, the application is reviewed by the Admissions Committee. In this review, although grades and MCAT scores are considered, major consideration is given to the essay portions of the applications, the letters of evaluation, and the interview reports, in

an attempt to assess those motivational and personal characteristics that th committee feels are important in choosing future physicians.

Applicants who are offered a place in the class are required, within two weeks to notify the Office of Admissions (M.D. Program) of the School of Medicine and Health Sciences in writing of their intent to accept the places reserved fo them. A deposit of $100 is also required by a specific date after notification o acceptance. The date will be given in the notice of acceptance. The deposi becomes nonrefundable two weeks prior to registration but will be credited toward the first semester's tuition.

PROGRAM OF STUDY

The faculty and administration of the School of Medicine and Health Sciences have developed a curriculum designed to prepare each student for a professional life of continuous learning. Because students differ in background ability, and career interests, the curriculum is balanced with required courses and students are encouraged to maximize achievement within their own limits. It is presumed that all graduates will seek additional education in graduate training programs before assuming complete responsibility for independent clinical decision-making.

In the first year, the student concentrates primarily on basic sciences, beginning with an orientation in cell biology taught by members of all basic science departments. The remainder of the first semester includes anatomy, and biochemistry. In the second semester, the student concentrates on physiology and microbiology in addition to an integrated course in neurobiology.

The second year integrates basic science and clinical information. Pathology and pharmacology provide the major basic science substrates. This academic program has been evolving since 1970 and several innovations have been introduced each year. The course is coordinated by a program director. Integration is accomplished through the work of faculty subcommittees working with the program director and the second year subcommittee on educational planning. Medical students are introduced to physical diagnosis during the first semester of the second year.

The final two years form a two-year continuum of required clerkships and elective sequences, designed to bring the student to optimal readiness for graduate training. Clerkships are required in medicine, surgery, pediatrics, obstetrics-gynecology, psychiatry, and health care sciences. Each student must complete a 4-week acting internship in one of the following: medicine, pediatrics, or family medicine. In addition, each student must take a 2-week clerkship in anesthesia and *two* 2-week clerkships from among the following: orthopaedics, urology, neurosurgery, or plastic surgery.

A variety of elective experience is available at the University and its affiliated hospitals; permission may be granted to take electives elsewhere.

During the entire educational experience, students are encouraged to assume responsibility for their self-assessment and continued learning. It is the goal of the faculty to select and educate concerned human beings who will function productively and effectively during a long career in medicine.

DEGREE REQUIREMENTS

Every candidate for graduation with the degree of Doctor of Medicine must have satisfactorily completed the requirements of the School of Medicine and

Health Sciences as described on page 30, including no less than four academic years of study as a matriculated student in medicine or the equivalent. All required courses must be completed and all prescribed examinations satisfactorily passed.

HONORS

Candidates who have completed the four-year course for the Doctor of Medicine degree and have received the grade of *H* (Honors) in courses totalling 50 per cent or more of the total number of semester hours taken may be recommended by the Executive Committee of the Medical Center for graduation "With Distinction."

COMBINED DEGREE PROGRAMS

Combined Bachelor of Arts and Doctor of Medicine

To be recommended for the degree of Bachelor of Arts, the candidate must complete at least 94 semester hours of prescribed college work (at least 30 hours and one year of residence must be completed in Columbian College of Arts and Sciences) and the first year of the medical curriculum. Upon satisfactory completion of the fourth year of the medical curriculum the student becomes eligible for the degree of Doctor of Medicine.

It should be understood, however, that admission to Columbian College does not guarantee admission to the School of Medicine and Health Sciences.

Combined Master of Science and Doctor of Medicine

The departments of the School of Medicine and Health Sciences cooperate with the Graduate School of Arts and Sciences in offering programs leading to the combined degrees of Master of Science and Doctor of Medicine in the fields of anatomic pathology, biochemistry, genetics, microbiology, mycology, pharmacology, and physiology.

Students in the School of Medicine and Health Sciences who wish to apply for the combined degrees of Master of Science and Doctor of Medicine must meet the requirements for admission to the Graduate School of Arts and Sciences. They must be recommended by the chairman of the department and by the Dean of the Graduate School of Arts and Sciences and the Dean for Academic Affairs of the Medical Center.

The Master of Science degree program consists of a minimum of 30 semester hours which includes a thesis (equivalent to six semester hours). For a Master of Science degree program which does *not* include a thesis, the number of semester hours of graduate course work is determined by the department. The program without the thesis is not an individual student option and is not available in every department.

A maximum of 12 semester hours of credit for graduate-level courses *completed as a part of the Doctor of Medicine degree* (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining semester hours of work, including a thesis if it is required, must be in course work in the basic medical sciences

normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

Dual Program for the Doctor of Medicine and Doctor of Philosophy Degrees

In cooperation with the Graduate School of Arts and Sciences a dual program is available to qualified students who seek both the Doctor of Medicine and Doctor of Philosophy degrees. The requirements which must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

To enter the dual degree program, a prospective student first must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. Upon admission to both schools, the student may then apply for affiliation with the dual degree program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a *departmental* doctoral committee and is available in more than 50 research fields.

A student working toward these degrees may apply a maximum of 24 semester hours of approved work taken in the M.D. degree program of the School of Medicine and Health Sciences toward the total of 72 semester hours required to complete the requirements for the Doctor of Philosophy degree. Twenty-four hours of this requirement must be earned in graduate courses during periods when the student is not obligated to full-time enrollment in the M.D. degree program, i.e., during summer sessions, vacation periods, etc. The final 24 semester hours of dissertation research toward the Doctor of Philosophy degree may begin concurrently with the final semester of graduate course work. The estimated time for completion of this dual program is six years.

Master of Science and Doctor of Philosophy Requirements

The detailed requirements for the degrees of Master of Science and Doctor of Philosophy are stated in the *Undergraduate and Graduate Catalogue* of the University, which is available at the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

FEES AND FINANCIAL REGULATIONS FOR M.D. CANDIDATES

The following fees have been established for the academic year 1977–78.

Application fee	$25.00
Tuition fee, for the academic year for 1st-year medical students	9,000.00
Tuition fee, for the academic year for 2nd-year medical students	7,500.00
Tuition fee, for the academic year for 3rd- and 4th-year medical students	6,000.00
University Center fee, charged all students (except those granted "leave of absence" status) each semester	50.00
Late registration fee, for failure to register within the designated period	15.00
Late payment fee, charged for failure to make payments when due (see "Payment of Fees," below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," below)	35.00

Continuous Registration fee, charged each student granted "leave of absence" status for each semester in the School of Medicine and Health Sciences	105.00
University Center fee, charged each student granted "leave of absence" status, each semester	4.75
Graduation fee	25.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for insufficient funds or for any other reason	15.00
Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for the first two copies is $2 each, fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Payment of Fees

The annual fee for the 1977-78 academic year is payable in two equal installments on or before registration day for each semester. Students registered for the summer session of fourth-year clerkships will be on "continuous registration" without charge until the following fall semester. No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees are payable at the Office of the Cashier of the University. Checks should be made payable to George Washington University, with student identification number shown in upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. While tuition is due and payable in full as described above, students may sign a deferred payment contract with the Student Accounts Office at the time of registration permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before October 26, 1977 (for the fall semester), and March 8, 1978 (for the spring semester). Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,500 or more per semester. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late payment fee and will be subject to the interest charge of eight per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of the deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

After entering the course of instruction the student is obligated for the tuition for the full semester. A student registered for the clerkships of the sum-

mer session is obligated for tuition due at the time of registration for the fol-
lowing fall semester, except that in the case of withdrawal or leave of absence
a *pro rata* payment will become due immediately.

Acceptance by the University of a student's fees does not in any way obli-
gate the School of Medicine and Health Sciences to accept the student for any
subsequent semester or summer session, and the right is reserved to require the
withdrawal of any student whenever, in the interest of the student or the School,
the Executive Committee of the Medical Center deems it advisable to do so.

Cost of Textbooks and Student Equipment

The minimum cost of necessary textbooks and student equipment (microscope,
drawing materials, glass slides, clinical thermometer, stethoscope, hemocytom-
eter, uniforms, etc.) is approximately as follows: first year, $700; second year,
$400; third year, $200; and fourth year, $200. Microscopes must be provided
by the student. Rentals are not available.

Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a
monthly basis are available. Terms and conditions vary, but most provide a life
insurance policy in the contract. For specific details and applications, address
inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Street, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue,
   Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply
of applications for these various programs, but will be happy to provide guid-
ance to students and parents.

REGULATIONS FOR M.D. CANDIDATES

Attendance

A student is not permitted to attend classes until registration has been com-
pleted and fees due have been paid. Regular attendance is required.

Grades

H—Honors; *P*—Pass; *F*—Failure; *IP*—In Progress; *I*—Incomplete; *W*—With-
draw.

Those students whose performances in a subject, as determined by the depart-
ment concerned, are of a very high caliber, and who, in addition, have demon-
strated those qualities of intellectual curiosity, integrity, and self-discipline
which clearly set them apart from the majority of the group, will be assigned
the grade of *H* (Honors).

The grade of *P* (Pass) will be assigned to all students who meet the minimum
standards of performance in a subject, as determined by the department con-
cerned, unless they are entitled to the grade of *H* (Honors).

The grade of *F* (Failure) will be assigned when a student fails to meet the minimum standards of performance in a subject, as determined by the department concerned. Students who receive the grade of *F* in any subject may not advance to the work of the following year until they have complied with such recommendations of the Committee on Educational Evaluation as are approved by the Dean for Academic Affairs of the Medical Center.

The grade of *IP* (In Progress) will be assigned to students in courses which require more than one semester for completion. A single definitive grade will be assigned upon completion of the entire course in a subsequent semester.

The grade of *I* (Incomplete) will be assigned when a student fails to complete all the required work in a course for reasons acceptable to the Associate Dean for Student Affairs and Admissions. A student in the first and second year may not proceed into the work of the following year until a grade of *I* has been removed; if not removed, a grade of *I* will be automatically changed to a grade of *F* (Failure) after one year. A student in the third or fourth year must remove a grade of *I* prior to graduation.

The grade of *W* (Withdraw) will be assigned only when a student is unable to continue in school for reasons acceptable to the Associate Dean for Student Affairs and Admissions (such reasons may *not* include poor scholarship). Such a student may be readmitted, at the discretion of the Associate Dean for Student Affairs and Admissions, within a period of two years, and may repeat for credit the course or courses in which the grade of *W* had been assigned.

Auditing

A student who receives grades of *F* in courses totalling six or more semester hours in one semester will be placed on academic probation for the following semester. A student who while on probation receives a grade of *F* in any course will be continued on probation for the following semester.

Probation

A student who receives grades of *F* in courses totalling six or more semester hours in one semester will be placed on academic probation for the following semester. A student who while on probation receives a grade of *F* in any course will be continued on probation for the following semester.

Academic Dismissal

A student (1) who exceeds three semesters, consecutive or otherwise, on probation; or (2) who receives grades of *F* in courses totalling 14 or more semester hours in any academic year; or (3) who receives grades of *F* in courses totaling more than 20 semester hours of work in the M.D. degree program; or (4) whose knowledge, character, or mental or physical fitness cast grave doubt upon his or her potential capabilities as a physician as determined by the Educational Evaluation Committee will not be allowed to continue in the M.D. degree program.

Examinations

Examinations, which may be written, oral, or practical, will be held during and/or at the end of each semester.

Graduation

Graduation follows satisfactory completion of the course of study, and does not imply the acquisition of a set number of credit hours.

Application for Graduation.—Application for graduation must be filed in the Office of the Dean for Academic Affairs, and the fee must be paid at the time of registration for the last semester of the fourth year.

Presence at Graduation.—A candidate is required to be present at the graduation exercises unless written application for graduation *in absentia* is approved by the Dean for Academic Affairs.

FINANCIAL AID

The following fellowships, scholarships, and loan funds are available to students in the School of Medicine and Health Sciences. Unless otherwise specified, inquiries should be directed to the Financial Aid Office of the Medical Center, George Washington University, 2300 Eye Street, N.W., Washington, D.C. 20037.

Fellowships

Wilbur J. and Edith K. Carr Memorial Fellowship Fund (1965).—By bequest of Edith K. Carr, former trustee of the University. The income from this fund provides fellowships in surgery, medicine, or medical research at the George Washington University Hospital.

Samuel Jordan Graham Fellowship in Surgery (1961).—By bequest, in memory of Judge and Mrs. Graham. The income from this fund, up to $2,000, may be used to assist students who are pursuing postgraduate study or research, preferably in surgery, at the School of Medicine and Health Sciences.

If no individual is conducting such work or deserving of the award, the income may be used to provide one or more scholarships (to cover tuition and other school expenses deemed appropriate) for students in the School of Medicine and Health Sciences. Application should be filed with the Chairman of the Department of Surgery no later than March 1.

Robin Miller Research Fellowship (1953).—A $3,000 fellowship established by bequest of Mrs. Robin Miller for the study of cardiovascular diseases.

Henry Rau Foundation Student Fellowship Grant (1967).—Awarded annually to a student in the School of Medicine and Health Sciences for research in cancer and allied diseases at the George Washington University Clinic.

U.S. Public Health Service Training Grants.—Information concerning training grants in fields of the medical sciences is available at the Office of the Dean for Academic Affairs of the Medical Center.

Scholarships

Scholarships awarded to students in the M.D. degree program are credited for the academic year unless otherwise specified. Each holder must carry a full schedule of academic work during the period for which the scholarship is awarded. Applicants should apply on prescribed forms which must be filed in the Financial Aid Office of the Medical Center no later than March 15 preceding the academic year for which the scholarship is to be awarded.

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship.—Awarded to a student on the basis of financial need and superior grades. Candidates must be citizens of the United States.

Armed Forces Health Professions Scholarship Program (1972).—Available to members of the armed forces who qualify under Public Law 92–426. Interested individuals should write to one of the following: (1) Department of the Army, DASG-PTP, Washington, D.C. 20314; (2) Bureau of Medicine and Surgery, Navy Department (Code 3174), Washington, D.C. 20372; (3) ATC/RSOS, Randolph Air Force Base, Texas 78148.

Anna Bartsch Hospital Intern Scholarship (1946).—A partial scholarship established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman intern in the University Hospital.

Dr. Edith SeVille Coale Scholarships (1965).—Provided at the request of Dr. Coale for women in the School of Medicine and Health Sciences. The scholarships are administered by the Zonta Club of Washington. Application should be made to the Financial Aid Office of the Medical Center no later than December 1.

Joseph Collins Foundation Scholarships (1951).—Available to medical students upon application through the Financial Aid Office of the Medical Center.

Nathan J. Epstein Scholarship (1972).—Available to medical students doing research to find a cure for stammering.

Joan Luria Hines Scholarship (1968).—Established by friends, students, and faculty of the School of Medicine and Health Sciences as a memorial to the wife of a medical student.

The Garfield and Rose Kass Medical Scholarship (1975).—Awarded on the basis of need to a worthy student in the School of Medicine and Health Sciences.

Ki-Wives of Washington Scholarship Fund (1958).—Three scholarships available to students in the School of Medicine and Health Sciences.

Sidney A. Levine Scholarship Fund (1971).—Established to assist medical students on the basis of need and academic performance.

Thomas M. Peery Scholarship (1974).—Awarded on the basis of need to a worthy student in the School of Medicine.

School of Medicine Scholarship Fund (1968).—Established by gifts of various and anonymous donors to assist medical students.

Gordon Fay Willey Scholarship (1974).—Awarded to students whose parents are U.S. citizens who are or were enlisted men, non-commissioned officers and officers below the grade of Major in the Army or Air Force or Captain in the Navy of the United States.

Winslow Foundation Scholarship (1974).—Available to medical students who are residents of Maryland, the District of Columbia, or North Carolina, on the basis of need.

Medical Student Research Scholarships and Traineeships.—For student participation in the research programs of the School of Medicine and Health Sciences or special training in research methods. Research scholarships are ordinarily awarded for full-time activity during the summer months; research traineeships support part-time work during the academic year. Scholars are "matched" with members of the faculty in accordance with their mutual interests. Trainees are designated by the departments responsible for the programs. These programs have been sponsored by the National Institutes of Health. In

addition a number of research scholarships have been made available through the Washington Heart Association.

School of Medicine Scholarship Fund

Scholarship aid is awarded from income on endowments that have been established by gifts from various donors for tuition awards to students in the School of Medicine and Health Sciences. Listed below are the endowments that support the School of Medicine Scholarship Fund:

Anna Bartsch Scholarship Fund (1946).—Established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman in the School of Medicine and Health Sciences "of outstanding scholarship, character, and promise, who intends to make the practice of medicine her life profession."

Jack I. Bender Scholarship Fund (1967).—Established by the family of Jack I. Bender as a memorial to their father. Awarded annually to a student on the basis of academic performance and need.

Everett Lamont Bradley Scholarship Fund (1954).—By bequest of Alice R.H. Bradley in memory of her son, for a student in the School of Medicine and Health Sciences.

Elma B. Carr Scholarship Fund (1976).—Created from income distribution of the Elma B. Carr, M.D. Trust, the income to be used for scholarships in the School of Medicine.

Oliver C. Cox Scholarship Fund (1973).—Established in memory of Dr. Oliver C. Cox, "for the establishment, support and maintenance of endowed scholarships in medicine."

David Perry Steinman Memorial Scholarship Fund (1960).—Established by friends and classmates. Awarded annually to a second-year student in the School of Medicine and Health Sciences on the basis of need and academic performance.

James J. Whisman Scholarship Fund (1966).—By bequest of James J. Whisman for needy and deserving students in the School of Medicine and Health Sciences.



Columbian Women Scholarship Funds

The Columbian Women Scholarships are awarded to women students on the basis of financial need and scholastic attainment. Candidates must have completed a minimum of 15 hours at this University with a minimum *B* (3.0) average, or the equivalent. A letter of application for these scholarships should be addressed to the Chairman, Columbian Women Scholarships, care of the Alumni Office, George Washington University, Washington, D.C. 20052, no later than May 15 for the fall semester, and January 1 for the spring semester. Scholarship aid is awarded from income of the following endowments:

Estelle M. Corbett Scholarship Fund (1973).—Created by gift of Elma Williams for tuition aid for a medical student.

Jessie Fant Evans Scholarship Fund (1967).—Established by bequest of Jessie Fant Evans, former Trustee of the University, for tuition aid.

Lewes D. and Myrtle H. Wilson Memorial Scholarship Fund (1926).—Established by Elizabeth Wilson, as a memorial to her parents, for tuition aid.

Loan Funds

A.M.A. Medical School Loan Fund.—Created in 1964 by the American Medical Association, to be loaned to students.

Morris and Gwendolyn Cafritz Foundation Loan Fund for Medical Students.—Created in 1977 by the Morris and Gwendolyn Cafritz Foundation, to be loaned to students.

Carr Loan Fund.—Created in 1962 by Edith K. Carr, to be loaned to students.

Himes Loan Fund.—Created in 1957 by Joseph H. Himes.

Kellogg Medical School Loan Fund.—Created in 1942 by the W.K. Kellogg Foundation, to be loaned to students.

Pfizer Loan Fund.—Created in 1953 by Charles Pfizer and Company, Inc., to be loaned to students.

School of Medicine Medical Student Loan Fund.—Created in 1952 by School of Medicine students, and augmented by a bequest from the estate of Ethel L. Murray to be loaned to students.

Strauss Medical School Loan Fund.—Created in 1975 by gift of Lewis H. Strauss and Mrs. Lewis L. Strauss in memory of Honorable Lewis L. Strauss, to be loaned to students.

Sutherland Loan Fund.—Created in 1941 by gift of Rose L. Sutherland and other donors.

Waller Loan Fund.—Bequest of Helen S. Waller received in 1973, to be loaned to deserving and needy students.

Wrather Loan Fund.—Created in 1967 by gift of Mrs. W.E. Wrather in memory of her husband, to be loaned to students.

In addition, financial assistance is available through the—

American Medical Association Medical Education Loan Guarantee Program (1960).—Available to medical school students (beyond the first semester of the M.D. degree program).

Catherine Breen Student Loan Fund (1972).—Established by alumni of the School of Medicine and Health Sciences in honor of Catherine Breen, former Assistant to the Dean of the Medical Center. Available to needy students who are candidates for the degree of Doctor of Medicine. Applications should be made to The George Washington University Medical Alumni Association.

Health Professions Student Loan Program.—This fund is available to a full-time student pursuing a course of study leading to the degree of Doctor of Medicine. Interns, residents, students engaged in premedical or other professional training, and students enrolled in programs of study other than those leading to the degree mentioned above are *not* eligible for these loans.

A candidate must (1) be a citizen of the United States or have such immigration status and personal plans as to indicate an intention to become a permanent resident of the United States, (2) be in need of the amount of the loan to be able to pursue the course of study, and (3) be in good standing with the School. Inquiries concerning deadlines and applications should be directed to the Financial Aid Office of the School of Medicine.

Jessie B. Martin Loan Fund (1967).—Established by friends of Jessie B. Martin, former Editor of Academic Publications at the University. An emergency fund for loans up to $200, repayable in 30-60 days, with interest rate of 3 per cent per annum. Application should be made to the Director of the Office of Student Financial Aid of the University.

PRIZES

Janet M. Glasgow Award of Outstanding Achievement, American Medical Women's Association, Inc.—Awarded annually if the student standing first in the graduating class is a woman.

American Medical Women's Association, Inc. Scholarship Achievement Citation.—Awarded annually to those female students who are considered "honor graduates" when ranked against all other students in the graduating class.

Samuel M. and Miriam S. Dodek Prize (1967).—Established in memory of Professor Bernhard Zondek, the eminent discoverer of the endocrinology of the human female reproductive cycle. Awarded annually to a member of the graduating class who has attained a commendable knowledge and understanding of the field of female endocrinology.

Allie S. Freed Prize (1957).—Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of preventive medicine.

Walter Freeman Prize (1966).—Awarded annually to a student in the graduating class who submits the best essay based on original investigation.

Alec Horwitz Prize (1959).—A prize of $100 awarded annually to a senior who has demonstrated exceptional proficiency in the field of surgery.

Oscar Benwood Hunter Prize (1952).—Established by The George Washington University Medical Society, now known as The George Washington University Medical Alumni Association. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pathology.

Jacobi Medical Society Prize (1962).—Established in memory of Dr. Abraham Jacobi, the founder of pediatrics practice in the United States. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pediatrics.

Howard Kane-A.F.A. King Obstetrical Society Prize (1937).—Established in memory of Dr. Howard Kane and Dr. A.F.A. King, who served as Professors in the School of Medicine and Health Sciences. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in obstetrics and gynecology.

Dr. Harold Lamport Biomedical Research Prize.—A prize of $150, established by the Lamport Foundation in memory of the late, distinguished physiologist, Dr. Harold Lamport, awarded annually to the student writing the best paper on original laboratory investigation in physiology.

Lange Medical Publications Prize.—Awarded annually to two members of the graduating class who are considered outstanding by their classmates. The prize consists of the graduate's choice of four books published by Lange Medical Publications.

Huron W. Lawson Prize (1957).—A prize of $100 established by Mrs. Lawson in memory of her husband, who was a distinguished member of the Medical Staff of the University, presented annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of obstetrics and gynecology.

Benjamin Manchester Prize (1966).—Established by a grateful patient in honor of Dr. Benjamin Manchester, clinical professor of medicine. Awarded annually to a member of the graduating class who has an outstanding record and shows promise of real humanitarianism in the practice of medicine.

C.V. Mosby Book Prize.—Awarded annually to five members of the graduating class who are considered outstanding by their classmates. The prize consists of the graduate's choice of a book published by C.V. Mosby Company.

Julius S. Neviaser Prize in Orthopaedic Surgery (1956).—A prize of $100 awarded annually to the senior who scores the highest grade in a written examination and clinical aspects of orthopaedic surgery.

John Ordronaux Prize (1907).—By bequest, $150 awarded annually to the member of the graduating class who has the highest scholastic standing.

William G. Schaffhirt Prize (1966).—By bequest, $200 awarded annually to a senior student for the best original essay or thesis on some medical subject of current public interest.

Upjohn Achievement Prize.—A prize of $200 and an inscribed plaque awarded annually to a member of the graduating class selected by his or her classmates on the basis of outstanding scholastic and personal achievement.

HONOR SOCIETIES

Alpha Omega Alpha.—National Honor Medical Society. Third- and fourth-year candidates for the M.D. degree meeting the qualifications specified by the constitution of the Society are eligible for election to membership.

William Beaumont Medical Society.—Medical students who have performed original research in the life sciences are eligible for membership, based upon the submission of an acceptable abstract of the research and election by society members. Outstanding students present their research findings at the annual Student Research Day. The Society also sponsors guest lectures in medical research and assists students in finding research opportunities within the Medical Center.

Howard Kane-A.F.A. King Obstetrical Society.—The 15 third- and fourth-year candidates for the M.D. degree who maintain the highest grades in their work in obstetrics are eligible for membership.

Smith-Reed-Russell Society.—M.D. degree candidates of the third and fourth years who have received the grade of *H* (Honors) in courses totaling 40 per cent or more of their total semester hours are eligible for membership.

MEDICAL ETHICS FORUM

The Medical Ethics Forum is a student-founded organization which sponsors an informal series of seminars. Speakers are invited to discuss current ethical questions with which students and doctors are confronted in medical practice and research. In addition, the Forum sponsors symposia to evaluate more thoroughly particularly seminal issues.

THE GERONTOLOGY PROGRAM

This program is designed to introduce and improve educational programs within The George Washington University and its School of Medicine and Health Sciences, to encourage research and student involvement in the field of aging. A Bachelor of Science in Health Sciences degree is presently offered through the Department of Health Care Sciences, and an area of concentration in Gerontology is planned. With the approval of their advisors, students in other schools in the University may select courses in gerontology and geriatric care, offered throughout the University, to explore gerontology as a career option or to develop an area of concentration. Students in approved programs may also draw on courses in gerontology offered through the Consortium of Universities to further their educational goals.

The following courses in gerontology and related topics are offered by Columbian College of Arts and Sciences, the School of Education, the School of Government and Business Administration, and the National Law Center:

HCA 250:	Delivery of Mental Health Services
HCA 260:	Introduction to Long-term Care Administration
HCA 261:	Seminar: Managing the Long-term Care Institution
HCA 265:	Readings in Long-term Care Administration
HCA 267:	Issues in Aging
Soc 181–11:	Sociology of Aging
Soc 181–12:	Sociology of Death and Dying
Educ 208:	Human Development
Educ 353:	Counseling Older Persons
Law 579:	Clinical Studies in Urban Law



UNDERGRADUATE PROGRAMS IN ALLIED HEALTH

Programs of study in allied health sciences at the School of Medicine and Health Sciences include those disciplines and skills that are allied to medicine in the delivery of health care and health education. The faculty of the School recognizes that modern medical practice requires increasing numbers of non-physician health care professionals; that such allied health personnel are appropriately educated in an academic health center; and that new roles for health care providers require the introduction of new curricula in allied health and nursing education.

Programs in Allied Health Sciences are currently offered leading to the degrees of (1) Associate in Science, with areas of concentration in Medical Laboratory Technique, Medical Services Technology, Nuclear Medicine Technology, and Radiologic Technology; and (2) Bachelor of Science in the fields of Health Science, Medical Technology, Nursing Anesthesia, and Radiologic Sciences and Administration, or with designation as Physician's Assistant or Nurse Practitioner.

Certificates are also awarded in the Medical Technology, Physician's Assistant, Nursing Anesthesia, and Nurse Practitioner programs. Special programs for second-career students may be arranged.

ADMISSION

The right is reserved to refuse admission to any student with an academic record which creates doubt of ability to succeed in college, or who, for any other reason, would not be an acceptable student. In the selection process, there is no discrimination because of sex, race, color, religion, or national or regional origin.

An application for admission to degree candidacy should be accompanied by a nonrefundable $10 application fee, payable by check to The George Washington University. The application fee is waived for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants should submit the application form and complete credentials by June 1. Some programs may require an earlier admissions date.

Forms for application for admission or readmission are available at, and should be returned to, the Office of Admissions, George Washington University, Washington, D.C. 20052.

Admission to Degree Candidacy

The following are required for admission to degree candidacy in all Allied Health programs:

1. Graduates of secondary schools must have a diploma based upon an acceptable academic record from an accredited secondary school. Applicants who have not graduated from secondary school must have satisfactory scores on the General Educational Development (GED) High School Level tests.

2. Students who have completed secondary school within two years of the date of their application for degree candidacy and who have not attended any other college or university must have acceptable scores on the Scholastic Aptitude Test (SAT) of the College Entrance Examination Board (CEEB)*; applicants without previous college work who have completed secondary school more than two years before their date of application may substitute acceptable scores on the College-Level Examination (CLEP) or acceptable scores on the General Educational Development (GED) High School Level test.

3. Students who have completed fewer than 12 semester hours of acceptable course work at an accredited college or university before applying for degree candidacy must have a secondary school record and acceptable scores on one of the three examinations listed in item 2 above.

4. Students who have completed 12 or more semester hours of acceptable course work at an accredited college or university must have maintained an overall quality-point index of 2.0 in course work; they must be in good standing as to scholarship and conduct and be eligible to return to the last previously attended institution in the same semester for which admission is sought to George Washington University. A student who has been academically dismissed or suspended more than twice is ineligible for consideration for at least five years from the date of the last suspension or dismissal.

REQUIRED CREDENTIALS

1. A transcript of secondary school work, or, for students who are not graduates of secondary schools, scores on the General Educational Development Test. Transcripts must be forwarded directly from the institution attended to the Office of Admissions. A transcript submitted directly by the student is not acceptable.

2. For applicants who have attended any college, university or other institution of higher learning, an official transcript forwarded to the Office of Admissions by each institution attended regardless of whether credit was earned or desired.

3. Scores on standardized examinations (ACT, SAT, CLEP, etc.) forwarded by the administering agency directly to the Office of Admissions.

4. Records from service schools.

* The College Entrance Examination Board test is preferred; however, the American College Testing battery (ACT) scores will be accepted.

ADVANCED TUITION DEPOSIT

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students, including those readmitted. This deposit is due May 1 for students entering in the fall semester, and December 15 for students entering in the spring semester. The deposit is credited toward tuition and is not refundable.

Admission as a Nondegree Student

A student who wishes to take individual courses in allied health programs without applying for degree candidacy must apply for admission to the University as an undergraduate unclassified student in the School of Medicine and Health Sciences. The Office of Allied Health and the chairman of the department offering the course shall determine whether admission will be granted to nondegree students. Credits earned as a nondegree student may be transferred to degree programs at the University provided the course(s) are applicable to the desired curriculum and the student meets the requirements of the degree program for which application is made.

Advanced Standing

Advanced standing may be awarded for course work taken at other accredited institutions at the college or university level or for nontraditional classroom or clinical experience. Students are reminded, however, that they must satisfy the residence requirement for their degree programs (see pages 57–58, 62) no matter how much advanced standing may be granted.

It is the responsibility of the student to have certified official transcripts of all course work taken at other institutions or the results of examinations sent by the issuing institution or agency directly to the Office of Admissions, George Washington University, Washington, D.C. 20052. If the applicant has fewer than 30 semester hours of acceptable credit (grades of *C* or better on academic work from an accredited institution) at the time the application is submitted, the applicant must have the secondary school record sent directly to the Office of Admissions from the school.

The University reserves the right to refuse credit for transfer in part or in whole, or to allow it provisionally. Credit so given may be withdrawn for subsequent poor work. No time limitation will be placed on the transfer of credits from other institutions, with the exception of the area of vocational competence (clinical applications as dictated by individual programs). Credit will not be granted for such work completed five or more years prior to application unless proficiency and/or continued maintenance of skills are demonstrated.

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Unlimited advanced standing may be awarded for appropriate course work completed with a minimum grade of *C* or its equivalent at other accredited institutions of higher learning, provided that the course is applicable to or comparable with a course in the required curriculum, or that the degree program

to which the student has been admitted has provisions for elective credit toward which the credit for advanced standing may be applied. Although a grade of *D* is not acceptable for transfer, a course in which a student has received the grade of *D* may be used to satisfy a curriculum requirement. It may not, however, be counted toward the total number of semester hours required for the degree, and it may not be repeated without the approval of the faculty advisor.

CREDIT FOR NONTRADITIONAL CLASSROOM OR CLINICAL EXPERIENCE

Assuming there is no duplication of course work earned, a maximum of 60 semester hours of advanced standing may be awarded on the basis of nontraditional classroom or clinical experience, by a combination of any of the methods listed below:

Credit from Service Schools.—A limited amount of credit may be assigned for selected service school instruction received since 1941. No more than 30 semester hours may be assigned for a combination of service schools and examinations referred to above. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces.*

Special Departmental Examinations.—A student may request any department to offer the student a special examination covering the subject matter of any specific course. Approval of such a request is not automatically granted; the student must offer evidence of sufficient occupational or educational background to indicate a reasonable command of the subject matter. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examination will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparation, administration, and grading of the examination.

Credit for College Entrance Examination Board College-level Examination Program (CLEP).—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations (with the exception of the English composition examination) passed at the 50th percentile or above (college sophomore norms). Credit is assigned for the Subject Examinations passed at the level recommended in the College Board model policy. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 592, Princeton, N.J. 08540.

Credit for New York State Board of Regent's Examination.—Applicants for degrees who present proper certification of award of a degree at the Associate's level from the New York State Board of Regents *may* be awarded a maximum of 60 semester hours of advanced standing.

Credit for Correspondence Courses.—A maximum of 30 semester hours of advanced standing *may* be awarded through the successful completion of appropriate correspondence courses offered by accredited colleges and universities.

Credit through United States Armed Forces Institute (USAFI) Examinations.—A maximum of 30 semester hours of advanced standing may be assigned for approved United States Armed Forces Institute college-level examinations passed with satisfactory scores.

Credit for educational programs in industrial and other noncollegiate organizations.—A maximum of 12 semester hours of advanced standing may be awarded for course work performed in noncollegiate programs using criteria developed by the American Council on Education and the New York State Board of Regents.

Currently registered degree candidates must obtain permission from the Office of Allied Health before registering to take examinations, correspondence courses, or courses at other accredited institutions.

Readmission

Students previously registered in the University who were not registered during the immediately preceding semester (summer sessions excluded), must apply for readmission. The final date for applying is the same as that for entering students (see page 44). Students who apply as degree candidates and who were previously registered as nondegree students, or who attended one or more institutions of higher learning during absence from the University, must have complete official transcripts sent to the Admissions Office of this University from each institution attended. Applications for readmission are considered on the basis of regulations currently effective.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time of the last registration at this University and who have not since registered at another institution.

Students From Foreign Institutions

Application, required records, and scores on the *Test of English as a Foreign Language* (see page 49) should be received from international students no later than March 1.

REQUIRED RECORDS

Applicants must request all educational institutions attended to send *directly* to the Office of Admissions, George Washington University, Washington, D.C. 20052, official credentials listing subjects studied, grades received, examinations taken and degrees received. Certified copies of diplomas and certificates from secondary schools and all colleges and universities attended are required. Records of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies which are sent should be accompanied by an English translation.

LANGUAGE TESTS

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* (TOEFL). Students are responsible for making arrangements for taking the test by addressing inquiries to the following agencies:

1. All European countries (including Cyprus, Great Britain, Iceland, and Ireland):

   CITO
   Postbus 1034
   Arnhem, Netherlands

2. All Middle Eastern and North African countries (except Israel):

   American Friends of the Middle East
   Abou Shakra Building
   Rue Bliss (Manara)
   Beirut, 2500 Lebanon

3. Hong Kong:

   Institute of International Education
   408 J. Hotung House, Fourth Floor
   5/15 Hankow Road, Kowloon, Hong Kong

4. India:

   Bureau of Educational Research
   Ewing Christian College
   Allahabad, U.P., 211003, India

5. Republic of China:

   Language Center, 2-1, Hsu-chow Road
   Taipei, Taiwan (100), Republic of China

All other applicants should address inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08540, U.S.A. The completed application form should be returned to the appropriate agency well in advance of the beginning of the semester for which the applicant seeks admission. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does not constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

In addition to the TOEFL, an admitted student may be required to report to the Admissions Office to make arrangements for taking an English Placement Test for foreign students prior to registration. Results of this test will determine the courses the student will be permitted to register for in the program of study.

FEES AND FINANCIAL REGULATIONS FOR UNDERGRADUATE STUDENTS IN ALLIED HEALTH PROGRAMS

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and

friends of the institution make up the difference.

The following fees and financial regulations were adopted for the 1977 summer sessions and the academic year 1977–78. (See page 51 for projected tuition increases for 1978–81.)

Tuition Fees

*Full-time on-campus program (12 or more semester hours), each semester	$1,400.00
Part-time on-campus program, for each semester hour	105.00
Summer Sessions, for each semester hour	98.00

University Center Fee (charged all students registered on campus, nonrefundable)

For students registered for 11 or more semester hours on campus: Each semester	50.50
For students registered for less than 11 semester hours in a semester on campus: For each semester hour for which the student registers	4.75
For students maintaining "continuous registration" status: Each semester	4.75

Additional Course Fees

In certain courses offered by Columbian College of Arts and Sciences, additional fees, such as laboratory and material fees, are charged as indicated in the course descriptions in the *Undergraduate and Graduate Bulletin*. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. Breakage of apparatus is charged against the individual student. When breakage is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Graduation Fees

Associate in Science	$10.00
Bachelor of Science	25.00

Residence Hall Fees (see page 15)

Special Fees and Deposits

Application fee	$10.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	100.00
Admission tests (when required)	6.00–12.00
Late-registration fee, for failure to register within the designated period	15.00

* For students in the Nurse Practitioner and Physician's Assistant Programs, the Summer Sessions portion of the programs will be considered a full semester, with total tuition for the Summer Session 1978 set at $1,400.

Late-payment fee, for failure to make payments when due (see "Payment of Fees," page 52)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for non-payment of fees (see "Payment of Fees," page 52)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for insufficient funds or for any other reason	15.00
Continuous Registration fee, to maintain "continuous registration" status during any semester of absence from the University or after completion of tuition requirements*—due and payable on the official days of registration	105.00
For special physical examination	2.00
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
For each examination to qualify for advanced standing and for each special examination	5.00
English test for foreign students (when required)	5.00
Laboratory checkout fee, for failure to check out of Chemistry laboratory by the date deadline set by the instructor†	10.00
Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for the first two copies is $2 each, fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the services of the Student Career Services Office; (2) the use of the University Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *University Hatchet*, the student newspaper; (6) admission to University debates; (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

Projected Tuition and Fee Increases 1978–81

So that students and their parents may plan more realistically for a total four-year period, tuition increases for the academic years 1978–79, 1979–80, and 1980–81 have been estimated as follows:

‡Increase by year (full-time undergraduate students):

1978–79	$200.00
1979–80	200.00
1980–81	200.00

* Payment of the continuous registration fee entitles the student who is granted leave of absence to return and continue work toward a degree under the academic requirements which were in force at the time of the student's first registration. The continuous registration fee applies toward neither tuition fee nor residence requirements for the degree.

† This fee does not apply to students granted military leave; see page 57.

† A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period.

‡ The Summer Sessions portions of the Nurse Practitioner and Physician's Assistant Programs are considered as full semesters in the setting of tuition; therefore, students enrolled in these programs should follow for an additional tuition increase of $100.

Increase by semester hour (graduate and part-time undergraduate students):

1978–79	5.00
1979–80	7.00
1980–81	8.00

It is not possible to project future economic data with certainty. Increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable and significant increases in tuition in excess of the above limits may be required.

Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration, and the remaining half on or before October 26, 1977 (for the fall semester), and March 8, 1978 (for the spring semester). No deferred payment is permitted for the summer session. Interest at the rate of eight per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $650.00 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of eight per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

Withdrawals and Refunds*

Applications for withdrawal from the University or for change in class schedule must be made in writing to the Office of Allied Health. Notification to an instructor is not an acceptable notice (see "Withdrawal," page 55).

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal from the University:*

FALL SEMESTER

Withdrawal dated on or before September 9, 1977	90 per cent
Withdrawal dated September 12 to September 23, 1977	75 per cent
Withdrawal dated September 26 to October 7, 1977	50 per cent
Withdrawal dated after October 7, 1977	none

SPRING SEMESTER

Withdrawal dated on or before January 20, 1978	90 per cent
Withdrawal dated January 23 to February 3, 1978	75 per cent
Withdrawal dated February 6 to February 17, 1978	50 per cent
Withdrawal dated after February 17, 1978	none

2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference in charges between the original program and the adjusted program continuing in effect.
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

In no case will tuition be reduced or refunded because of absence from classes. Payment applies only to the semester for which a registration charge is in-

* Regulations concerning withdrawal and refunds for the summer sessions are stated in the *Summer ...tions Schedule of Classes.*

curred and will not be credited to another semester (exception: students granted military leave, see page 57).

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

REGULATIONS FOR UNDERGRADUATE STUDENTS IN ALLIED HEALTH PROGRAMS

Attendance

A student may not attend classes until registration is completed and fees due are paid. A student may attend only those classes for which registered. Regular attendance is expected. A student may be dropped from any course for undue absence.

Scholarship Requirements

A student who fails to maintain the scholarship requirements of the School of Medicine and Health Sciences may be dismissed from the University.

GRADES

Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal. In certain courses, an alternate grading system of *CR* (Credit) and *NC* (No Credit) may be used. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a grade of *D* or better was received, unless required to do so by the department concerned. A written statement to this effect must be submitted to the Registrar by the appropriate department chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Whenever a grade has not been assigned, the symbol *I* (Incomplete), the symbol *W* (Authorized Withdrawal) or the symbol *F* (Unauthorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, the instructor may initiate an appropriate grade change. A grade of

I automatically becomes a grade of *F* one calendar year after the date of the last class meeting in the semester for which the grade of *I* was assigned.

THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index, obtained by dividing the number of quality points by the number of semester hours for which the student has registered, both based on the student's record in this University. Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for each semester hour for which the student has registered. Courses in which the grades of *W* or *I* are assigned are not considered in determining the index, except that a course in which the grade of *I* has been assigned will be considered when a formal grade has been recorded. Grades earned at other institutions are not considered in computing the quality-point index.

DEAN'S HONOR LIST

Students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list is limited to full-time students registered for a minimum of 12 semester hours and part-time students registered for a minimum of 12 semester hours over two consecutive semesters, which may include a summer term.

PROBATION

A student who has attempted a minimum of 12 semester hours of course work and whose cumulative quality-point index is below 2.00 is placed on probation for the period in which he or she next attempts 12 additional semester hours of work. A student whose attendance or conduct has been unsatisfactory is placed on disciplinary probation for the period in which he or she next attempts 12 additional semester hours of work.

SUSPENSION

A student whose cumulative quality-point index remains below 2.00 after a 12-semester-hour period of probation is suspended.

A student suspended for poor scholarship may not register for course work, even as an auditor. The student may apply for readmission after the lapse of either the fall or spring semester following suspension. Evidence must then be presented to the chairman of the department concerned demonstrating a better qualification to pursue college-level course work. A student suspended twice for poor scholarship may not be readmitted after the second suspension.

Withdrawal

Withdrawal from a course or from the University requires the permission of the office of Allied Health. Permission to withdraw from the University will not be granted a student who does not have a clear financial record (see "Withdrawals and Refunds," page 53).

All charges for courses dropped without the approval of the Office of Allied Health must be met by the student. Reporting the dropping of a course to an instructor does not constitute an official withdrawal.

Changes in Program of Study

Changes within the School of Medicine and Health Sciences' Allied Health Programs.—A student may not substitute one course for another, drop courses (see "Withdrawal," above), change status from credit to audit or audit to credit without the approval of the Office of Allied Health.

Change from one section to another of the same course may be made with the approval of the Office of Allied Health and the chairman of the department concerned.

Change from one area of concentration to another within the School of Medicine and Health Sciences may be made with the approval of the Office of Allied Health and the chairman of the department concerned. All requirements of the course of study to which the change is made must be met.

Transfer within the University.—Application for transfer to another college, school, or division must be made to the Office of Admissions. A maximum of 45 semester hours earned in the Division of University Students may be applied toward a bachelor's degree in the School of Medicine and Health Sciences.

Credit

Credit is given only after registration for a course and satisfactory completion of the required work, or upon the assignment of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

Auditing.—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

Post-Admission Transfer Credit

A student who plans to attend another institution and apply credit so earned toward graduation from this University must first secure the written approval of the Office of Allied Health. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

Balance Sheet

Sometime during each undergraduate student's first semester, the Office of Allied Health will issue a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

Transcripts of Record

Official transcripts of student records are issued on request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $

fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript.

Continuous Registration

Degree candidates are expected to maintain continuous registration until *all* degree requirements are satisfied. Students who have completed course registration must maintain continuous registration by paying the "continuous registration" fee (see page 51). By failing to register for one semester or more, the student breaks registration and must be readmitted (see "Readmission," page 48). A "readmitted student" is subject to the regulations and requirements in force at the time of readmission.

Students must be registered during the summer if they are taking courses or are expecting to be graduated at the end of the Summer Sessions.

Military Leave

A student called to active duty may be granted military leave for the period of active duty, upon presentation to the dean of a copy of the military orders and a petition for such leave. The maintenance of "continuous registration" is not required of the student on military leave; however, the student must apply for readmission to the University well in advance of the semester of expected return. Payments for tuition and fees which are not refunded to the student at the time military leave is granted will be maintained as a deferred credit for the student's account and used upon return to the University.

Graduation Requirements

Degrees are conferred in February, May, and September.

To be recommended by the Faculty for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which registered; and be free from all indebtedness to the University. Registration, either for course work or on the "continuous registration" fee basis, is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation.—An "Application for Graduation" form *must* be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) dated September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship.—The student must meet the scholarship requirements for the particular degree for which registered.

Curriculum.—Minimum curriculum requirements for each degree are stated on pages 58, 62.

Residence.—A minimum of 18 semester hours of course work in the area of concentration for the Associate in Science degree and a minimum of 30 semester hours of course work in the area of concentration for the Bachelor of Science degree must be completed while registered in the School of Medicine and

Health Sciences. This requirement applies to students transferring within the University as well as to students transferring from other institutions.

Attendance and Conduct.—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

With Distinction

In all undergraduate divisions of the University a baccalaureate degree may be conferred "With Distinction," at the discretion of the faculty, if a student meets the specific requirements of the college or school in which enrolled.

Students in the Allied Health programs must have a quality-point index of 3.50 or higher in all course work taken at this institution. To be eligible a student must have completed at this institution at least one-half of the courses required for the degree.

FINANCIAL AID

For full-time undergraduate students, George Washington University has a program of financial assistance consisting of scholarships, loans, grants, part-time employment, or any combination of these resources. The University participates in the National Direct Student Loan, Supplemental Educational Opportunity Grant, and College Work-Study programs. Financial aid is awarded on the basis of the student's scholastic record, financial need, and qualities of leadership. Complete information concerning financial assistance is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

REQUIREMENTS FOR THE DEGREE OF ASSOCIATE IN SCIENCE

The satisfactory completion of a minimum of 60 semester hours of course work is required for the degree of Associate in Science; however, some departments may set the requirements above the minimum. The course work must be distributed as follows:

1. **Human Competence**

   A minimum of six semester hours in English Composition (Engl 9 or 10 and 11 or 12), plus a minimum of six semester hours of meaningful initiation into the humanities, social studies, or mathematics.

2. **Subject Competence**

   The number of semester hours required depends on the student's specific area of concentration. However, students must elect courses related to allied health sciences in biological sciences, mathematics, or physical sciences. (Students may not use the same mathematics courses to satisfy both the human competence [see above] and subject competence requirements.)

3. **Vocational Competence**
   A minimum of 30 semester hours in vocational competence skills related to the area of concentration.

4. **Elective**
   The number of elective hours depends on the number of semester hours of specific required courses the student has in the selected program of study; in some programs the student may be allowed to choose electives, but in others the student may be required to elect specific courses.

Students who plan to pursue a bachelor's degree are advised to plan their associate's degree program so that they will satisfy the prerequisites to the degree of their choice.

Scholarship Requirements

An over-all quality-point index of 2.0 is required for course work leading to the degree of Associate in Science. A quality-point index of 2.50 is required for course work in the student's area of concentration. See page 54 for explanation of the grading system and the quality-point index.

Residence Requirement

A minimum of 18 semester hours of course work in the area of concentration must be satisfactorily completed in residence in the School of Medicine and Health Sciences.

MEDICAL LABORATORY TECHNIQUE PROGRAM

The program of study leading to the degree of Associate in Science with a concentration in medical laboratory technique is offered only to military students off campus.

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 44–45. Mature students who do not meet these requirements *may* be considered for degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50. The qualifying course work must include nine semester hours in biological sciences, chemistry, or mathematics, and six semester hours in at least two other areas.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 61 semester hours of course work is required:

Nonclinical Course Work

	Semester Hours
Engl 9 or 10 and 11 or 12 (or equivalent)	6
Math 3 and 6 (or equivalent)	6

Chem 9 or 11 (or equivalent)	4
Chem 8 (or equivalent)	2
	18
Clinical Course Work	
Path 13, 14, 15, 16, 17, 18, 19, and 20	43
Total	61

MEDICAL SERVICES TECHNOLOGY PROGRAM

The program of study leading to the degree of Associate in Science with a concentration in medical services technology is offered only to military personnel off-campus.

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 44–45. Mature students who do not meet these requirements *may* be considered for degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50.

DEGREE REQUIREMENTS

The satisfactory completion of 62 semester hours of course work is required.

	Semester Hours
Courses Outside the Area of Concentration	
Engl 9 or 10 and 11 or 12 (or equivalent)	6
Psyc 1 or Soc 1	3
Elective (to be selected in consultation with the advisor)	6
	15
Area of Concentration	
HCS 10, 11, 15, 16, 22, 67, 68, 92, 93, 94, 95, 96	47
Total	62

NUCLEAR MEDICINE TECHNOLOGY PROGRAM

The program of study leading to the degree of Associate in Science with a concentration in nuclear medicine technology is offered both on and off campus.

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 44–45. Applicants must be at least 18 years of age by the time of first registration. A personal interview or a letter of recommendation may be required for some students. Mature students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory

completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50.

DEGREE REQUIREMENTS

The satisfactory completion of 60 semester hours of course work is required. Bioc 101 and HCS 110 and 111, or their equivalents, are prerequisite to all other courses in nuclear medicine technology.

Courses Outside the Area of Concentration	Semester Hours
Engl 9 or 10 and 11 or 12 (or equivalent)	6
Social Studies (as determined by the faculty advisor; Psyc 1 recommended)	3
Humanities (selected from art, music, philosophy, or religion)	3
	12
Area of Concentration	
Rad 43, 44, 55, 56, 57, 58, 59, 65, 66, 72, 75, 81, 82, 93, 94, 98	48
Total	60

RADIOLOGIC TECHNOLOGY PROGRAM

The program of study leading to the degree of Associate in Science with a concentration in radiologic technology is offered only to military students off campus.

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 44–45. A personal interview or a letter of recommendation may be required for some students. Mature students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50.

DEGREE REQUIREMENTS

The satisfactory completion of 61 semester hours of course work is required:

Courses Outside the Area of Concentration	Semester Hours
Engl 9 or 10 and 11 or 12 (or equivalent)	6
Social Studies (as determined by the faculty advisor)	3
Humanities (as determined by the faculty advisor)	3
	12
Area of Concentration	
Rad 40, 41, 42, 50, 51, 60, 61, 62, 70, 71, 80, 90, 95, 96, 97, 99	49
Total	61

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

The satisfactory completion of a minimum of 120 semester hours of course work is required for Bachelor of Science programs; however, some departments may set the requirements above the minimum. The course work must be distributed as follows:

1. **Human Competence**
   A minimum of six semester hours in English Composition (Engl 9 or 10, and 11 or 12) plus 24 semester hours of meaningful initiation into any two of the three general areas of the humanities, social studies, or mathematics.
2. **Subject Competence**
   A minimum of 30 semester hours of didactic information related to allied health sciences. This requirement may include the biological sciences, mathematics, or the physical sciences.
3. **Vocational Competence**
   A minimum of 60 semester hours in vocational competence skills related to the area of concentration.

Scholarship Requirements

An over-all quality-point index of 2.0 is required for course work in programs leading to the Bachelor of Science degree. A quality-point index of 2.50 is required for designated course work in the student's area of concentration. See page 54 for explanation of the grading system and the quality-point index.

Residence Requirement

A minimum of 30 semester hours of course work in the area of concentration must be satisfactorily completed in residence in the School of Medicine and Health Sciences.

HEALTH SCIENCES PROGRAM

The Bachelor of Science degree program in Health Sciences is currently offered to Advanced Hospital Corps and Independent Duty Technician students off-campus.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is required for the degree of Bachelor of Science in Health Science, distributed as follows:

Human Competence—30 semester hours required:
- 6 hours in English composition
- 3 hours in psychology
- 21 hours in the humanities and social studies

Subject Competence—30 semester hours required:

		Semester Hours
HCS 010:	Anatomy and Physiology	3
HCS 016:	Clinical Laboratory Techniques and Procedures	4
HCS 015:	Pharmacology and Toxicology	5
HCS 119:	Introduction to Patient Care	4
HCS 116:	Medical Terminology	2

Plus an additional 12 semester hours of didactic information related to allied health sciences, which must include biological sciences, mathematics, and physical sciences.

Vocational Competence—60 semester hours required:

HCS 092:	Medical Material Management	3
HCS 093:	Health Systems Administration	4
HCS 125:	Manifestations of Disease	10
HCS 102:	Food and Water Sanitation	4
HCS 022:	Introduction to Epidemiology	2
HCS 067:	Disaster Sanitation	2
HCS 068:	Environmental Sanitation	3
HCS 096:	Clinical Experience	12

Plus an additional 20 hours of course work in medical subjects directly applicable toward the health sciences.

MEDICAL TECHNOLOGY PROGRAM

The satisfactory completion of 120 semester hours of course work is required for the degree of Bachelor of Science in the field of medical technology.

RESIDENCE REQUIREMENT

A minimum of 60 semester hours must be spent in residence for the degree of Bachelor of Science in the field of medical technology, including the 12-month medical technology program at the University Hospital in the fourth year (Path 121, 122, 123, 124, 125, 126, 127, 128).

CURRICULUM

1. **First Two Years**

		Semester Hours
Engl:	Engl 9 or 10 and 11 or 12	6
Humanities:	Six semester hours selected from one of the following combinations: Art 31–32; Art 71–72; Engl 51–52; Engl 71–72; Engl 191–92; Mus 3 and 4; Rel 9 and 10; or Rel 59 and 60	6
Math:	Math 3, 6	6
	NOTE: the Math 3 requirement may be satisfied by offering two years of high school algebra acceptable for admission; the Math 6 requirement may be satisfied by offering one-half year of high school trigonometry acceptable for admission.	

Science:	BiSc 11–12, 111	12
	Chem 11–12, 22	12
Social Studies:	Six semester hours selected from one of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40; Hist 71–72; PSc 1 and 2; PSc 2 and 3; or Soc 1 and 2	6
Elective:	Courses in the humanities and social studies	12
		60

2. Junior Year

Chem 50:	Introduction to Organic Chemistry	4
BiSc:	Four semester hours selected from the following	4
BiSc 104:	Comparative Vertebrate Anatomy	
BiSc 127:	Genetics	
and BiSc 128:	Genetics Laboratory	
BiSc 148:	Histology	
BiSc 154:	Vertebrate Zoology	
BiSc 163:	Human Physiology	
and BiSc 164:	Human Physiology Laboratory	
Electives:	Nonscience courses	22
		30

3. Senior Year

Path 121:	Introduction to Medical Technology	4
Path 122:	Clinical Chemistry Lecture	3
Path 123:	Clinical Microbiology Lecture	2
Path 124:	Blood Bank Lecture	1
Path 125:	Clinical Hematology Lecture	2
Path 126:	Selected Topics in Laboratory Medicine	2
Path 127:	Clinical Laboratory Rotation	7
Path 128:	Clinical Laboratory Rotation	9
		30
	Total	120

The fourth-year courses constitute the major. Each candidate must make application to take the 12-month medical technology program at the University Hospital; this should be done early in the third year. Although admission to the degree program does not assure acceptance into the medical technology program at the Hospital, George Washington University students are given preference.

The Bachelor of Science degree in the field of medical technology is also offered to military personnel off-campus. Students must have completed at least 90 semester hours of course work equivalent to the first three years of the on-campus curriculum before being considered for admission to the senior year off-campus.

Military students in the off-campus program must complete the following courses with a quality-point index of 2.50 or better.

Path 100:	Clinical Chemistry Lecture	4
Path 102:	Clinical Chemistry Laboratory	4
Path 104:	Clinical Microbiology Lecture	

Path 106:	Clincal Microbiology Laboratory	4
Path 108:	Blood Bank Lecture	4
Path 110:	Blood Bank Laboratory	3
Path 112:	Hematology Lecture	4
Path 114:	Hematology Laboratory	3
		30

PHYSICIAN'S ASSISTANT PROGRAM

The program leading to the degree of Bachelor of Science with designation as Physician's Assistant requires the satisfactory completion of 120 semester hours of course work.

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 44–45. In addition, three letters of recommendation, a personal interview, one year (2,000 hours) of patient-care experience, and satisfactory completion of a course in general chemistry are required.

SCHOLARSHIP REQUIREMENTS

Scholarship requirements are stated on page 62. Candidates for the degree of Bachelor of Science with a designation as Physician's Assistant must maintain an overall quality-point index of 2.00 for course work taken in the Physician's Assistant program. A quality-point index of 2.50 is required for those courses designated in the core curriculum (area of concentration). Each student must complete and pass all courses for which registered in any given semester before being allowed to advance to the next semester.

RESIDENCE REQUIREMENT

A minimum of 75 semester hours in the preclinical and clinical portion of the Bachelor of Science degree curriculum must be completed in residence at the School of Medicine and Health Sciences.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is required for the Bachelor of Science degree with a designation as a Physician's Assistant, distributed as follows:

Human Competence—30 semester hours required:
6 hours in English composition
24 hours in the humanities and social studies

Subject and Vocational Competences—90 semester hours required:

Basic Health Sciences

		Semester Hours
HCS 110:	Structure of the Human Body	3
Bioc 111:	Biochemistry for Allied Health Sciences	3

Micr 128:	Microbiology for New Health Practitioners	2
Path 129:	Pathology for New Health Practitioners	3
Path 152:	Introduction to Basic Laboratory Medicine	3
Phar 158:	Pharmacology for New Health Practitioners	2
Phyl 111:	Physiology for New Health Practitioners	3

Basic Clinical Sciences

HCS 109:	Human Behavior I	2
HCS 119:	Introduction to Patient Care I	1
*HCS 125:	Manifestations of Disease	8
*HCS 134:	Introduction to Patient Care II	2
HCS 137:	Issues in Health Care	1
HCS 140:	Clinical-Pathological Correlation	0
HCS 146:	Surgical and Diagnostic Procedures	0
HCS 147:	Introduction to Radiology	1
HCS 148:	Introduction to Electrocardiography	1
HCS 150:	History Taking Review and Theory	0
HCS 151:	Clinical Pharmacology	2

Clinical Clerkship

*HCS 160:	Medical Inpatient	5
*HCS 163:	Medical Outpatient	5
HCS 166:	Surgical Inpatient	5
HCS 169:	Obstetrics and Gynecology	5
*HCS 172:	Pediatric Outpatient	5
*HCS 175:	Primary Care Preceptorship	12
HCS 178:	Emergency Medicine	5
HCS 198:	Psychiatry	5
HCS 199:	Independent Study	5

Other Required Courses

HCS 113:	Medicine and Society	1
HCS 116:	Medical Terminology	0

CERTIFICATE

A certificate is awarded upon completion of the 90-semester-hour sequence of required and elective courses in health care sciences.

NURSING ANESTHESIA PROGRAM

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 44–45. In addition, candidates for the degree must also fulfill the following requirements:

1. They must have graduated from a state-approved school of nursing. Nurses with an Associate degree may be accepted into the program after completing a minimum of twelve months of practical experience in critical care nursing.

* Designates area of concentration course work which must be completed with a cumulative quality point index of 2.50.

2. They must be licensed as registered professional nurses in at least one state, U.S. territory, or the District of Columbia.
3. They must satisfy the requirements of the school of anesthesia at one of the affiliated hospitals.

ADVANCED STANDING

The general provisions for awarding of advanced standing are stated on pages 46–48. In addition, the following specific criteria apply for the Bachelor of Science degree in Nursing Anesthesia.

1. Students who are graduates of two- or three-year nursing school programs and who have had a minimum of twelve months of practical experience in critical-care nursing *may* receive up to 45 hours of advanced standing credit in Nursing.
2. Students who have earned a B.S. degree in Nursing *may* receive up to 60 hours of advanced standing credit in Nursing.
3. Certified Registered Nurse Anesthetists will receive credit in Nursing on an individual basis. Students seeking award of advanced standing credit on the basis of anesthesia work experience must provide evidence of demonstrated clinical competence.

Students who graduated from nursing school more than five years ago and have not been active in nursing during the last five years may be required to take National League of Nursing or New York State Board of Regents examinations.

SCHOLARSHIP

Students must maintain an overall quality point index of 2.50 on all nursing anesthesia courses (area of concentration). Any student who does not maintain a 2.50 average will be required to take additional course work in order to obtain a minimum 2.50 average on the 30 hours of required courses.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is required for the Bachelor of Science degree in Nursing Anesthesia, distributed as follows:

1. Thirty semester hours of course work in the area of human competence, including at least six semester hours in English (Engl 9 or 10, and 11 or 12), three semester hours in Psychology (Psyc 001), and 21 semester hours of meaningful initiation into two of the following areas—social studies, humanities, and mathematics.
2. Thirty semester hours of course work in the area of subject competence, including course work in the biological and physical sciences. (Note: Advanced standing credit awarded for nursing school experience may be used to fulfill this requirement.)
3. Sixty semester hours of course work in the area of vocational competence skills directly related to nursing anesthesia, consisting of the following courses:

YEAR I

		Semester Hours
Phar 021, 022:	Chemistry and Physics of Anesthesia	6
Phar 110, 111:	Pharmacological Basis of Anesthesia	8
Anes/Phar 195:	Electronics for Medical Personnel	2
Anes/Phar 191:	Respiratory Care	3
Anat 115:	Anatomy for Nurse Anesthetists	3
Phyl 115:	Physiology for Nurse Anesthetists	3
HCS 134:	Introduction to Patient Care II	2
Anes 198:	Pathological Physiology and Anesthesia	3
		30

YEAR II

Anes/Phar 193:	Methods and Procedures in Anesthesia	4
Anes 194:	Principles of Clinical Anesthesia	26
		30

All students must complete Year I course work, in residence, with an overall quality-point index of 2.50 or better. Certified Registered Nurse Anesthetists may waive Year II clinical course work on the basis of documented evidence of clinical competence after successful completion of Year I course work.

CERTIFICATE

A certificate is awarded upon completion of the 60-semester-hour sequence of required courses in the nursing anesthesia program.

NURSE PRACTITIONER PROGRAM

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 44–45. Candidates for the degree of Bachelor of Science with designation as Nurse Practitioner must also fulfill the following requirements:

1. They must have been graduated from a school of nursing with an over-all quality-point index of at least 2.00 or the equivalent.
2. They must be licensed as registered nurses in at least one state or the District of Columbia.
3. They must have had a minimum of three years' experience in nursing practice in hospital and ambulatory settings.
4. They must have three letters of recommendation forwarded from employers, supervisors in the health field, and/or acquaintances.

Preference will be given to applicants who have made arrangements with a physician or an institution to be employed as a nurse practitioner.

SCHOLARSHIP

The grades of *CR* (Credit) and *NC* (No Credit) are given. A student who has received a grade of *NC* in any of the preclinical courses will be ineligible to continue in the clinical portion of the program until the course has been re-

peated and a grade of *CR* has been received. Progress through each portion of the clinical phase will be evaluated by the faculty in charge of that particular rotation.

ADVANCED STANDING

General provisions for advanced standing are listed on pages 46–48. In addition, students may receive up to 45 semester hours of advanced standing for successful completion of nursing school. No advanced standing will be granted in the required 60-semester-hour area of concentration.

RESIDENCE REQUIREMENT

A minimum of 45 semester hours of course work in the area of concentration must be completed in residence in the School of Medicine and Health Sciences.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is required for the degree of Bachelor of Science with designation as a Nurse Practitioner, distributed as follows:

Human Competence—30 semester hours required:

6 semester hours in English composition
24 semester hours in the humanities and social studies, which must include:

HCS 109:	Human Behavior	2
HCS 137:	Issues in Health Care	1

Subject and Vocational Competences—90 semester hours required:

Clinical Health Sciences

HCS 110:	Structure of the Human Body	3
HCS 119:	Introduction to Patient Care I	1
HCS 125:	Manifestations of Disease	8
HCS 134:	Introduction to Patient Care II	2
HCS 142:	Nurse Practitioner Seminar I	2
HCS 143:	Nurse Practitioner Seminar II	3
HCS 144:	Nurse Practitioner Seminar III	1
HCS 145:	Management of Primary Care Problems	2
HCS 147:	Introduction to Radiology	1
Micr 128:	Microbiology for New Health Practitioners	2
Path 129:	Pathology for New Health Practitioners	3
Path 152:	Introduction to Basic Laboratory Medicine	3
Phyl 111:	Physiology for New Health Practitioners	3

Clinical Rotations

HCS 153:	Gynecology Outpatient	3
HCS 157:	Primary Care Preceptorship	6
HCS 165:	Medical Outpatient	arr.
HCS 171:	Pediatric Outpatient	3
HCS 179:	Emergency Medicine	2

Electives

HCS 193:	Issues in Aging	3
HCS 154:	Independent Study	arr.

A minimum of 30 semester hours of course work in the physical, natural, and mathematical sciences is required. Advanced standing awarded for nursing school experience may be used to fulfill this requirement.

CERTIFICATE

Nurse Practitioner certification will be granted to those students who meet the requirements for admission to the degree program and who complete the 45-semester-hour area of concentration.

RADIOLOGIC SCIENCES AND ADMINISTRATION PROGRAM

The program leading to the degree of Bachelor of Science in the field of Radiologic Sciences and Administration requires the satisfactory completion of a minimum of 120 semester hours of course work. This program is designed for registered technologists in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology who wish to continue their education at the baccalaureate level.

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 44–45. In addition, students applying to the program must be registered technologists or registry-eligible within the first academic semester. A personal interview or a letter from the principal or dean of the school previously attended is required. Students whose previous schooling suggests inadequate preparation in physics and mathematics may be required to complete successfully Rad 92 before placement in either Rad 167 or Rad 171.

ADVANCED STANDING

General provisions for advanced standing are stated on pages 46–48. Students may be granted up to 48 semester hours of advanced standing credit if (1) they have completed study within the last five years, with a quality-point index of at least 2.50 or a grade average of at least 80 per cent, at a radiologic technology, nuclear medicine technology, or radiation therapy technology school that is accredited by Joint Review Committee on Education Programs in Radiologic Technology or Nuclear Medicine of the Council on Medical Education of the American Medical Association, or (2) they are certified as American Registered Radiologic Technologists, Nuclear Medicine Technologists, or Radiation Therapy Technologists.

SCHOLARSHIP

Scholarship requirements are stated on page 62.

DEGREE REQUIREMENTS

Human Competence

A minimum of 30 semester hours is required, including BAd 102, 105; Engl 9 or 10 and 11 or 12; Psyc 1; Soc 1. Recommended electives include Engl 101;

Hum 26; Psyc 151; Soc 129; SpDr 111, 121; or other courses in the humanities or social sciences.

Subject and Vocational Competences

A total of 92 semester hours is required. Of these, a maximum of 48 semester hours is allowed for course work in an American Medical Association approved program in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology. The remaining 44 semester hours consist of the following required courses:

	1. **Radiologic Sciences**	Semester Hours
CIEng 101:	Practical Computing for New Health Practitioners	3
Rad 167:	Radiation Physics and Safety I	3
Rad 171:	Radiological Electronics and Engineering	3
Rad 175:	Physics of Radiological Imaging,	
Rad 176:	Physics of Nuclear Medicine,	
or Rad 177:	Dosimetry in Radiation Therapy	3
Rad 190:	Radiobiology	3
Rad 195:	Directed Study in Radiation Physics	2
		17
	2. **Radiologic Administration**	
HCA 142:	Financial Management in Health Care Institutions	3
HCA 153:	Survey of Health Care Organization	3
HCA 154:	Introduction to Hospital Management and Procedures	3
HCA 170:	Quantitative Methods in Health Care Administration	3
Psyc 144:	Personnel and Industrial Psychology	3
Rad 140:	Radiology Administration	4
Rad 145, 147, or 149:	Administrative Project	3
Rad 150:	Radiology Senior Study	2
Soc 124:	Medical Sociology	3
		27
	Total	44

Required or Recommended Courses in Allied Health Programs Offered in Other Divisions of the University

The following courses are offered by Columbian College of Arts and Sciences or the School of Government and Business Administration, and are either required or recommended in specific undergraduate programs in the School of Medicine and Health Sciences. Students are reminded, however, that not all these courses are acceptable even as electives in certain Allied Health Programs. Students

should consult with the program advisor in choosing electives for the particular program in which they are enrolled.

Courses acceptable to meet human competence requirements:

Humanities

Art History
Classics
East Asian Languages and Literatures
English
Germanic Languages and Literatures
Music
Philosophy
Religion
Romance Languages and Literatures
Slavic Languages and Literatures
Speech and Drama

Social Studies

American Civilization
Anthropology
Economics
Geography and Regional Science
History
Journalism
Political Science
Psychology
Sociology

ACCOUNTING

1 **Introductory Accounting** (3)
Basic understanding of accounting concepts, procedures, analyses, and reports; the accounting measurement and communications of significant economic and financial data. Laboratory fee, $25 per semester.

AMERICAN CIVILIZATION

71–72 **Introduction to American Civilization** (3–3)
Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance.

ANTHROPOLOGY

1–2 **Introductory Anthropology** (3–3)
Anth 1: survey of man's origin, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior.

ART HISTORY

31–32 **Survey of Western Art** (3–3)
Survey of the arts in the Western world from prehistoric to modern times. A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art.

71–72 **Introduction to the Arts in America** (3–3)
Painting, sculpture, and architecture of America, with selected references to crafts and popular arts. Art 71: from Colonial beginnings to the Republican Age. Art 72: from 19th century to the present.

BIOLOGICAL SCIENCES

11–12 Introductory Biology for Science Majors (4–4)

Lecture (3 hours), laboratory (3 hours). Biological principles and problems designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $18 per semester.

104 Comparative Vertebrate Anatomy (4)

Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $20.

111 Introductory Microbiology (4)

Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Material fee, $20.

127 Genetics (3)

Introductory course. Basic aspects of transmission of genetic traits with particular reference to the chemical basis of heredity and gene action.

128 Genetics Laboratory (1)

Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $20.

148 Histology (4)

Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $20.

154 Vertebrate Zoology (4)

Lecture and discussion (2 hours), laboratory and field (4 hours). Vertebrate natural history and systematics, emphasizing higher and transitional taxa. Prerequisite: BiSc 104. Material fee, $20.

163 Human Physiology (3)

Introduction to the function of organ systems of the human body.

164 Human Physiology Laboratory (1)

Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Material fee, $24.

165 Vertebrate Physiology (4)

Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $24.

BUSINESS ADMINISTRATION

102 Fundamentals of Management (3)

Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking.

105 **Personnel Management** (3)

The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities.

CHEMISTRY

8 **Physiological Chemistry** (2)

Chemical aspects of selected topics in human physiology. A chemistry elective for students in off-campus Allied Health Programs.

9 **General Chemistry** (4)

Offered only off campus. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, inquantitative analysis. Prerequisite: one year of high school algebra. Laboratory fee, $23.

11–12 **General Chemistry** (4–4)

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $28 per semester.

22 **Introductory Quantitative Analysis** (4)

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28.

50 **Introduction to Organic Chemistry** (4)

Lecture (3 hours), laboratory (3 hours). A terminal course for students in related disciplines. Prerequisite: Chem 12 or 16. Laboratory fee, $28.

ECONOMICS

1–2 **Principles of Economics** (3–3)

Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics.

ENGLISH

9 **English Composition: Language as Communication** (3)

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semester hours of credit; the reading course meets an additional three hours a week for a maximum of 10 weeks. Fees: tuition, $315; special fee, $25.

10 **English Composition: Language as Communication** (3)

Study and practice of expository techniques; emphasis on the rhetorical

complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure.

11 **English Composition: Language and the Arts and Sciences** (3)

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and of diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12.

12 **English Composition: Language in Literature** (3)

Study and practice of expository and argumentative techniques through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and in diction, and on logical thought, by the study of literary genres and of the use of language in literature. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11.

20 **The Writing of Reports** (3)

Offered only off campus. Theory and practice in the writing of technical reports. Prerequisite: Engl 9 or 10 and 11.

43–44 **Classical Humanities** (3–3)

Offered only off campus. Interdisciplinary study of the origins of Western thought. Reading and intensive class discussions of selections from the Bible and from five works each semester from the following authors: Homer, Hesiod, Aristophanes, Plato, Aristotle, Aeschylus, Euripides, Sophocles, Herodotus, Thucydides, Lucretius, Marcus Aurelius, Epictetus, Polybius, St. Augustine. Background lectures on the major intellectual, artistic, economic, and social movements. Prerequisite: Engl 9 or 10.

45–46 **Humanities in the Modern World** (3–3)

Offered only off campus. Interdisciplinary study of modern Western thought from the Renaissance to the 20th century. Reading and intensive class discussion of five works each semester from the following authors: Machiavelli, Pope, Voltaire, Rousseau, Goethe, Tolstoy, J.S. Mill, Zola, Nietzsche, Kierkegaard, Freud, Kafka, Koestler, T.S. Eliot. Background lectures on the major intellectual, artistic, economic, and social movements. Prerequisite: Engl 9 or 10.

51–52 **Introduction to English Literature** (3–3)

Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature. Prerequisite: Engl 9 or 10.

71–72 **Introduction to American Literature** (3–3)

Historical survey. Engl 71: from beginnings to the Civil War. Engl 72: from the Civil War to present. Prerequisite: Engl 9 or 10.

101 **Expository Writing** (3)

Types of expository writing; weekly exercises based on students' needs; particular attention may be given to problems in the writing of graduate theses. Prerequisite: Engl 9 or 10; 11 or 12.

191–92 **Introduction to European Literature** (3–3)

Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid;* dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann. Prerequisite: Engl 9 or 10.

EXPERIMENTAL HUMANITIES

*26 **Environmental Issues** (3)
An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy.

GEOGRAPHY AND REGIONAL SCIENCE

51 **Introduction to Geography** (3)
General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts.

52 **Introduction to Economic Geography** (3)
Examination of the basic principles which determine the location of economic activities.

HEALTH CARE ADMINISTRATION

†142 **Financial Management in Health Care Institutions** (3)
Consideration of the nature, analysis, and interpretation of accounting data. Cost accounting, budgeting and internal control techniques, emphasis on their use in the management planning and control process.

153 **Survey of Health Care Organization** (3)
Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system.

154 **Introduction to Hospital Management and Procedures** (3)
Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and on the functions of the department manager.

†170 **Quantitative Methods in Health Care Administration** (3)
Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise, and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than upon manipulating predeveloped formulas.

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* Offered jointly by the Division of Experimental Programs and the Departments of Biological Sciences and Geography and Regional Science.

† Generally offered only off campus for students enrolled in the Bachelor of Science in Health Care Administration degree program at the Naval School of Hospital Administration. Offered on campus when justified by sufficient enrollment.

HISTORY

39–40 European Civilization in Its World Context (3–3)

Hist 39: political, social, economic, and cultural history to early modern era. Hist 40: from early modern era to present.

71–72 Introduction to American History (3–3)

Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present.

MATHEMATICS

3 College Algebra (3)

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry.

6 Plane Trigonometry (3)

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor).

9 General Mathematics I (3)

For students electing Math 9 and 10 as a terminal sequence. Logic, sets, number systems. Prerequisite: two years of high school mathematics.

10 General Mathematics II (3)

Mathematical systems, geometry, and introduction to statistics and probability. Prerequisite: Math 9.

30 Precalculus (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry.

31 Calculus of One Variable (3)

Differentiation and integration of algebraic and elementary transcendental functions, with simple applications. Prerequisite: Math 30 or equivalent.*

51 Mathematics for the Social and Management Sciences I (3)

Notion of function, graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration.

52 Mathematics for the Social and Management Sciences II (3)

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra, determinants, rudiments of linear programming. Prerequisite: Math 51 or 53.

*Math 30 may be waived as a prerequisite by examination on scheduled dates.

MUSIC

3 Introduction to Musical Understanding (3)
Introductory history of musical styles, related to listening; elements and materials of music.

4 Survey of Music Literature (3)
Introductory study of musical forms, structures, and textures; aural analysis of selected literature.

PHILOSOPHY

50 Introduction to Philosophy (3)
Readings from major philosophers and study of philosophic positions from Plato to the present.

POLITICAL SCIENCE

1 Introduction to Comparative and International Politics (3)
(Formerly PSc 5 Introduction to Political Science)
Comparative political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies.

2 Introduction to American Politics and Government (3)
(Formerly PSc 6 Introduction to Political Science)
Structure, powers, and processes of the American political system.

3 Introduction to Political Behavior (3)
(Formerly PSc 4 Introduction to Political Science)
Study of political behavior, including the role of politics in today's world, the sources of elite and mass political behavior, and the influence and nature of political institutions.

PSYCHOLOGY

1 General Psychology (3)
Fundamental principles underlying human behavior.

8 Psychology of Motivation and Personality (3)
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized. Prerequisite: Psyc 1 or equivalent.

22 Introduction to Educational Psychology (3)
The contributions of psychology to education; emphasis on learning. Prerequisite: Psyc 1 or equivalent.

144 Personnel and Industrial Psychology (3)
Psychological concepts and methods applied to problems of personnel

management, human engineering, employee motivation and productivity. Prerequisite: six semester hours in psychology.

151 **Social Psychology** (3)

Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism, and war. Prerequisite: six semester hours in psychology.

RELIGION

9 **The Hebrew Scriptures** (3)

Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities.

10 **The New Testament** (3)

Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles.

59 **Religions of the East** (3)
(Formerly History of Religions)

Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto.

60 **Religions of the West and Near East** (3)
(Formerly History of Religions)

History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments.

SOCIOLOGY

1 **Introductory Sociology** (3)

General principles of sociology; development of culture and personality, impact of groups and institutions on man's social behavior.

2 **Major Social Issues** (3)

Critical examination of selected major social issues confronting American society. Topics change each semester. May be repeated once for credit. Prerequisite: Soc 1.

124 **Medical Sociology** (3)

Social factors and processes related to the etiology and treatment of physical and mental illnesss; medical occupations and professions, medical organizations, problems of delivery of health care services. Prerequisite: Soc 1.

129 **Race and Minority Groups** (3)

Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice. Prerequisite: Soc 1.

SPEECH AND DRAMA

111 Business and Professional Speaking (3)

Study of the communication process in business and professional speaking; practice in presenting technical reports; selling policies, programs, and services; interviews; conferences; speech in training and supervisory activities. Primarily for nonmajors.

121 Group Discussion and Conference Leadership (3)

Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prerequisite: SpDr 1, *Communicative Speaking and Listening*, or permission of instructor.

STATISTICS

***51 Introduction to Business and Economic Statistics** (3)

Lecture (3 hours), laboratory (1 hour). Frequency distribution, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation, time series, index numbers. Laboratory fee, $18.

***91 Principles of Statistical Methods** (3)

Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. Laboratory fee, $18.



* Stat 51; 53, *Introduction to Statistics in Social Sciences;* and 91 are related in their subject matter and credit hours for only one of the three may be applied toward a degree.

COURSES OF INSTRUCTION

The School of Medicine and Health Sciences serves other divisions of the University by making available to nonmedical students certain undergraduate and graduate courses in the following departments: anatomy, biochemistry, microbiology, pathology, pharmacology and physiology. The courses listed are subject to change. The University reserves the right to withdraw any course announced.

STAFF OF INSTRUCTION

The Staff of Instruction listed under each department is for the academic year 1976–77.

EXPLANATION OF COURSE NUMBERS AND SYMBOLS

A number in parentheses after the name of the course indicates number of semester hours of credit which may be earned. Five semester hours of credit per four-week elective period are granted for all fourth-year courses in the M.D. program.

Courses numbered from 1 to 100 are for first- and second-year undergraduate allied health students. Courses numbered from 101 to 200 are for third- and fourth-year undergraduate allied health students. Courses in the basic science departments numbered from 201 to 400 are for candidates for the M.D. degree and for students in the Graduate School of Arts and Sciences. All other courses numbered from 201 to 400 are primarily for candidates for the M.D. degree.

KEY TO ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting	**Anth**	Anthropology
AmCv	American Civilization	**ApSc**	Applied Science
Anat	Anatomy	**Art**	Art
Anes	Anesthesiology	**ArTh**	Art Therapy

Bioc Biochemistry
BiSc Biological Sciences
BAd Business Administration
Cart Cartography
Chem Chemistry
Chin Chinese
CE Civil Engineering
CH&D Child Health and Development
Clas Classics
ClEn Clinical Engineering
CSci Computer Science
Derm Dermatology
Econ Economics
Educ Education
EPol Education Policy
EE Electrical Engineering
EAd Engineering Administration
EngS Engineering Science
Engl English
EFL English as a Foreign Language
EnHe Environmental Health
Envr Environmental Studies
Hum Experimental Humanities
ForS Forensic Sciences
Fren French
Gnet Genetics
Geod Geodesy
Geog Geography and Regional Science
Geol Geology
Geop Geophysics
Ger Germanic Languages and Literatures
HCA Health Care Administration
HCS Health Care Sciences
Hist History
HKLS Human Kinetics and Leisure Studies
Idis Interdisciplinary Courses
IAf International Affairs
Ital Italian
Japn Japanese
Jour Journalism
Law Law
LEnf Law Enforcement
Mgt Management Science
Math Mathematics
ME Mechanical Engineering
M&PA Medical and Public Affairs
Med Medicine
Micr Microbiology
Mus Music
NSur Neurological Surgery
Neur Neurology
Ob&G Obstetrics and Gynecology
Ocea Oceanography
OR Operations Research
Opth Ophthalmology
Oral Oral Biology
Orth Orthopaedic Surgery
Otol Otolaryngology
Path Pathology
Phar Pharmacology
Phil Philosophy
Phys Physics
Phyl Physiology
PSc Political Science
Port Portuguese
Pchi Psychiatry and Behavioral Sciences
Psyc Psychology
PAd Public Administration
Rad Radiology
Rel Religion
SLP Service-Learning Program
SPSc Service-Learning Political Science
Slav Slavic Languages and Literatures
Soc Sociology
Span Spanish
SpEd Special Education
SpDr Speech and Drama
Stat Statistics
Surg Surgery
TCom Telecommunication Operations
U&RP Urban and Regional Planning
Urol Urology
WStu Women's Studies

Anatomy

Chairman: R.S. Snell

Professors F.D. Allan, T.N. Johnson, R.S. Snell
Professorial Lecturers J.L. Angel, T.S. Reese, M.F. Brightman

Associate Professors E.N. Albert, M.J. Koering
Associate Professorial Lecturers J.A. Di Paolo, E.J. Blanchette-Mackie, K.S. Weston
Assistant Professors M.D. Olson, J.M. Kerns, D.B. Jenkins, D.A. Neufeld, B.E. Gilson
Assistant Professorial Lecturer D.A. Davis
Special Lecturer M.F.K. Ericksen

115 **Anatomy for Anesthetists** (3) **Staff**
For nursing anesthesia students. Anatomical facts and concepts essential for safe administration of anesthetics; emphasis on anatomy of head and neck.

*201 **Anatomy** (12) **Staff**
Integrated anatomical disciplines: regional gross dissection, histology, embryology. (Fall)

202 **Gross Anatomy** (6) **Snell and Staff**
For graduate students. Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 **Human Embryology** (1) Snell and Allan
For graduate students. Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) **Johnson, Kerns**
For graduate students. Gross and microscopic anatomy of central nervous system and special senses. Students who have received credit for Anat 204 may not register for Anat 212. Laboratory fee, $13. (Fall)

205 **Human Microscopic Anatomy** (3) Albert and Staff
For graduate students. Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (3) Albert
Theory and operation of the scanning electron microscope along with the techniques involved in preparation of tissues and interpretation of micrographs. Laboratory fee, $30.

208 **Comparative Vertebrate Neurology** (1) Johnson
For graduate students. Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2) Allan
For graduate students. Preparation of a significant audiovisual program of some aspect of human anatomy. Laboratory fee, $20. (Spring)

210 **The Use of Computers in Anatomy** (2) Snell
For graduate students. Applying computer techniques to the problems of learning anatomy. Limited enrollment. Laboratory fee, $20. (Spring)

* Required for medical students.

211 The Cell in Medicine Staff
(Formerly Cell Biology)
Integrated survey of the structure, function, and metabolism of the cell.

212 Neurobiology (3) Staff
For graduate students. Same as Idis 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221–22 Seminar (1–1) Gilson
For graduate students. Research reports and discussions of special topics by guest lecturers, staff, and graduate students. Medical students encouraged to attend. (Academic year)

249 Introduction to Anatomical Research (1) Staff
For graduate students. Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 Physical Anthropology (1) Angel
Variations in humans and factors affecting them, human evolution and racial differences, anatomy and culture of ancient man. (Spring)

254 Fetal Anatomy (2) Allan
Dissection of the midgestational human fetus. Comparison of fetal and adult structures. 20 students. Laboratory fee for nonmedical students, $10. (Spring)

256 Human Genetics (1) Staff
General principles of genetics, new cytogenetics techniques, aneuploidy in man and its significance, biochemical aspects of heredity, genetic counseling. (Spring)

260 Electron Microscopy in Cellular Biology—Lecture (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopy. (Spring)

261 Electron Microscopy in Cellular Biology—Laboratory (2) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee for nonmedical students, $15. (Spring and fall)

262 Gross Anatomy of Upper and Lower Extremities (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

263 Applied Anatomy of the Autonomic System (5) Allan
Comprehensive study of the structure and function of the autonomic nervous system. 4-week elective periods. Snell

264 Gross Anatomy of Head and Neck (2)
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell

Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staff

Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

270 **Dissection of the Human Brain** (1) Johnson

Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

272 **Autonomic Nervous System** (1) Allan

Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff

Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, etc. May be repeated for credit. (Spring)

279 **Applied Regional Anatomy** (5) Snell

Regional dissection, guided readings, weekly discussions. 4-week elective periods.

281 **Applied Anatomy of the Newborn** (5) Allan, Snell

The full-term fetus or neonatal infant examined by dissection or by study of pre-dissected specimens. 4-week elective periods.

282 **Advanced Neuroanatomy** (5) Johnson

Dissection of the human brain, study of slides of the central nervous system, and an introduction to neurological research. 4-week elective periods.

284 **Applied Surface Anatomy and Radiology** (5) Snell

Detailed study of anatomical structures which are accessible to examination in the living subject; normal radiology of the body. 4-week elective periods.

285 **Application of Audiovisual Techniques to Anatomy** (5) Allan

Students identify, develop, and produce an audiovisual program on some aspect of human anatomy. 4-week elective periods.

287 **Human Cytogenetics** (10) C. B. Jacobson

Chromosomal research on reproductive anomalies, congenital malformations, mutagenic assay. Tissue culture, photomicrography, karyotypic analysis, genetic counseling. 8-week elective periods. Univ. Hosp.

288 **Surface Anatomy and Radiology** (1) Snell

Lectures and demonstrations on areas of clinical importance.

289 **Application of Computer Techniques to Anatomy** (5) Snell

Anatomical program designed to demonstrate the application of com-

puter techniques to problems of learning anatomy. 4-week elective periods.

Snell

291 **Special Projects in Anatomy** (5)
Independent study on an aspect of gross anatomy. 4-week elective periods.

Koering

292 **Advanced Reproductive Endocrinology** (5)
Study of structure and function of male and female reproductive organs; emphasis on correlating their activities with those of other endocrine glands. 4-week elective periods.

Staff

295 **Research** (arr.)
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

Staff

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

Staff

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Anesthesiology

Chairman: C.S. Coakley

Professors C.S. Coakley, S. Alpert, B.S. Epstein, P. Mazel, R.J. Van Houten, H. Weintraub

Associate Professors W.L. Marsh, P.R. Kaiser, M. Kennedy, G.A. Morales, R.E. Tobey, B.S. Dunbar, J.B. Craft, Jr., A.H. Altstatt, J.E. Zimmerman

Associate Clinical Professor S.N. Albert

Assistant Professors M.J. Shaffer, J.P. Swope, M.T. Karna, M. Shahvari, M.F. Gonzales, D.S. Lee, V.A. Argumedo, S.R. Deshmukh, M.H. Thein, D.B. Peterson, J.A. Tam, J.M. Klick, A. Fields, P. Holbrook, E.J. Distelhorst, Jr., B.E. Filner, S.J. Aidinis, P.J. Corso, L.A. Coveler, J.F. Jones, P.R. Lichtenthal, L. Mantel, J.F. Mayhew, W.A. McGill II, B. Tsai

Assistant Clinical Professors W.E. Bageant, C. Albert, P. Lowenthal, M.W. Lichtmann, H.W. Manitsas, W.M. Garrett, R.D. McKay, N.E. Wilson

Courses numbered 190 through 198 are for nursing anesthesia students.

Staff

190 **Seminar: Anesthesiology** (4)
Small discussion groups on morbidity and mortality from actual and reported cases. Topics related to complications of anesthesia.

Staff

191 **Respiratory Care** (3)
Advanced techniques for the care of patients requiring total prolonged respiratory support.

192 **Orientation for Anesthesia** (3) **Staff**

Lecture, group discussion, and audiovisual presentation. History of anesthesia, legal aspects, ethics, psychology, professional adjustments, department management, and organization.

193 **Methods and Procedures in Anesthesia** (4) **Staff**

(Formerly three credits)

At affiliated hospitals. Lecture, group discussion, and audiovisual presentation. Anesthesia techniques, positions in anesthesia, types of anesthetic required to meet the needs of different surgical specialties, and related topics.

194 **Principles of Clinical Anesthesia** (26) **Staff**

(Formerly three credits)

Twelve-month course at affiliated hospitals. Supervised clinical training and experience. The student is assigned patients, organizes and administers anesthesia, and follows the patients through their total hospitalization. Designed to satisfy the American Association of Nurse Anesthetists requirements.

195 **Electronics for Medical Personnel** (2) **Staff**

Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care unit. Power, biomedical voltages and transducers, blood pressure and heart rate monitors, displays, telemetry, special purpose instruments, safety hazards analysis techniques for technical equipment procurement. (Fall)

198 **Pathological Physiology and Anesthesia** (3) **Staff**

Review of patho-physiology of major organ systems in relation to anesthesia. Clinical implications of various disease states, their interactions with anesthetics, and effects on anesthetic management.

*302 **Clinical Clerkship** (2½) **Staff**

Clinical preoperative evaluation, surgical and obstetrical anesthesia, infant and adult resuscitation, inhalation therapy, management of patients in coma, shock, and other problems which may be encountered in medical practice. 1 week—Univ. Hosp., 1 week—Walter Reed Gen. Hosp. or Wash. Hosp. Center. (2-week periods throughout academic year)

380 **Anesthesiology** (5) **Weintraub**

Clinical experience in preoperative evaluation, surgical and obstetrical anesthesia, infant and adult resuscitation, inhalation therapy; monitoring and blood gas determinations. 4-week elective periods. Univ. Hosp.

384 **Intensive Care Unit** (5) Shahvari, Zimmerman

Evaluation and management of respiratory failure, rationale and use of automatic ventilators, chronic airway management, cardiovascular support, and intensive care. 4-week elective periods. Univ. Hosp.

386 **Intensive Care Unit** (5) **Rosenthal**

Evaluation and management of respiratory failure, rationale and use of automatic ventilators, airway management, cardiovascular support techniques, and intensive care medicine. 4-week elective periods. Nat'l Naval Med. Center.

* Required for medical students. Part of Med 308. Credit assigned after completion of Med 308.

390 **Extramural Anesthesiology Elective** (arr.)
The department arranges for students to spend elective periods at other institutions. Interested students should contact Dr. Herbert Weintraub.

Biochemistry

Chairman: C.R. Treadwell

Professors C.R. Treadwell, B.W. Smith, G.V. Vahouny, J.M. Bailey, H.H. Hess
Professorial Lecturers W.W. Burr, Jr. *(Isotopes)*, E. Steers, Jr., G. Guroff, A.N. Schechter, E.P. Anderson, C.R. Merril, J.C. Smith, Jr., M.L. Minthorn, Jr.
Associate Professor G.A. Walker
Assistant Professors L.L. Gallo, M.A. Vander Maten *(Research)*, R.W. Bryant, Jr. *(Research)*
Assistant Professorial Lecturer C.L. Trichilo
Lecturer P.H. Fishman

101 **Chemistry for Allied Health Sciences** (2)

111 **Biochemistry for Allied Health Sciences** (3) Staff

•201 **Medical Biochemistry**
Lectures and laboratory; emphasis on basic principles and their relation to medicine. (Fall)

221–22 **General Biochemistry** (3–4) Gallo, Vahouny and Staff
(Formerly 3 or 4—4 or 5 credits)
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Generally, graduate students must register concurrently for Bioc 223 and for Bioc 224. However, graduate students taking Bioc 225-26, Fore 281-82, Micr 241-42 or Phys 223-24 may register for Bioc 221-22 without the laboratory. With specific recommendations by the undergraduate advisor and the department, undergraduate students may register for Bioc 221-22 without laboratory. Prerequisite: Chem 152, 154. (Academic year)

223–24 **Biochemistry Laboratory** (1–1) Gallo and Staff
(Formerly Bioc 224 Biochemistry of Enzymes [1])
Laboratory complement of Bioc 221-22. Concurrent registration in Bioc 221-22 required. Materials fee, $20 a semester. (Academic year)

225–26 **Biomedical Instrumentation** (4–4) Smith and Staff
Same as Micr 241-42 and Phyl 223-24. Comprehensive study of theoretical and practical application of biomedical instrumentation to the

• Required for medical students.

separation, identification, and quantification of materials of interest to biomedical and forensic scientists. Laboratory fee, $50. (Academic year)

227 **Biochemistry Seminar** (1) **Bailey**

Current literature in biochemistry. Intended for graduate students, but open to a limited number of specially qualified medical students. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (1) **E. Anderson**

Two separate courses are offered in alternate years, each covering both general and advanced material; students may register for these in either order and cover the entire content in two years. The full content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 221. (Fall)

232 **Proteins and Amino Acids I** (1) **Steers, Schechter**

Prerequisite: Bioc 201 or 221. (Fall)

233 **Proteins and Amino Acids II** (1) **Steers, Schechter**

Continuation of Bioc 232. Methods for the study of protein confirmation; determination of active sites of enzymes; mechanisms of reactions at the active site. (Spring)

241 **Isotopes** (3) **Burr**

Theoretical characterization of isotopes and their applications in biology and medicine. Attention given to counting, health physics and radiation safety, autoradiography, chromatography. Laboratory fee for nonmedical students, $16. (Spring)

251 **Carbohydrate Metabolism** (1)

Prerequisite: Bioc 201 or 222. (Spring, even years)

252 **Biochemistry of the Brain** (1) **Staff**

For medical students; open to limited number of graduate students. Recent biochemical developments in structure, functions, and metabolic processes unique to the brain. (Spring)

254 **Human Nutrition** (1) **Staff**

For medical students; open to limited number of graduate students. Application of nutritional principles in humans. (Spring)

256 **Biochemistry of Organ Function** (1) **N. Kramer**

For medical students; open to limited number of graduate students. Emphasis on biochemical processes unique to particular organ systems; application of these processes to evaluation of function. (Spring)

260 **Biochemistry of the Steroids** (1) **O. Dodek**

For medical students; open to limited number of graduate students. Basic chemistry of the steroids, pathways of biosynthesis and metabolism, regulatory mechanisms, physiologic effects, clinical measurement of endogenous steroids, clinical manifestations of steroid imbalance, steroid changes in pregnancy, and steroid therapy. (Spring)

262 **Biochemistry of the Lipids** (1) Vahouny

Discussion of topics of current interest, including digestion, energy production, biosynthesis, function in specialized tissues and subcellular particles. Content differs each time course is offered; may be repeated for credit. (Spring)

264 **Membrane Associated Complex Lipids** (1) Fishman

Topics will cover the catabolism and biosynthesis of complex sphingolipids; inherited metabolic diseases associated with abnormal sphingolipid metabolism; altered glycosphingolipid biosynthesis associated with malignant transformation; potential roles of gangliosides as membrane receptors for toxins and hormones; aspects of membrane structure and biochemistry.

266 **Biochemical Genetics and Inherited Metabolic Diseases** (1) Merril

For medical students; open to limited number of graduate students. Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. (Spring)

*268 **Muscle Contraction: Physiological and Biochemical Aspects** (2) Walker, Frank

Anatomical, biochemical, pharmacological, and physiological aspects of muscle contraction. Prerequisite: An introductory course in biochemistry and physiology, or permission of the Department.

279 **Research in Renal Function, Mutarotase, and Sugar Transport** (10) Bailey

Clinical significance of plasma mutarotase levels in kidney disease. 8-week elective periods.

280 **Research in Experimental Atherosclerosis** (10) Bailey

Study of factors influencing the development and course of atherosclerosis in rabbits. 8-week elective periods.

281 **Research in Biochemistry of Carbohydrates and Enzymes** (10) B. Smith

Research in a problem already under investigation in the department or a project in related fields suggested by the student. 8-week elective periods.

282 **Research in Biochemistry of Lipid Metabolism and Transport** (10) Vahouny

Biochemical investigation of a clinical problem involving lipids of special interest to the student, or participation in existing research program in the department. 8-week elective periods.

283 **Research in Metabolic Regulation within the Heart** (10) Vahouny

Studies on metabolic regulation and effects of drugs. 8-week elective periods.

284 **Research in Cholesterol Absorption and Metabolism** (10) Ga

Participation in departmental research program involving the mechanism and prevention of cholesterol absorption. 8-week elective periods.

* An interdisciplinary course offered by the Physiology and Biochemistry Departments.

286 **Research in Biochemistry and Molecular Biology of RNA Tumor Viruses or DNA Polymerases of Mammalian Cells** (10) — R.C. Gallo*

Investigative work at the National Cancer Institute, NIH. 8-week elective periods or equivalent.

287 **Research on the Function of B_{12} Coenzymes in Cell Replication** (10) — Walker

Research in a problem under investigation in the department. 8-week elective periods.

288 **LDH Viruses in Immunosuppression** (10) — Bailey

Changes in plasma enzyme clearance and cellular immune mechanisms in LDH virus infection. 8-week elective periods.

290 **Extramural Biochemistry Elective** (arr.) — Staff

The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

295 **Research in Biochemistry** (arr.) — Staff

For first- and second-year medical students and graduate students. Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) — Staff

(Fall and spring)

398 **Advanced Reading and Research** (arr.) — Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) — Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Child Health and Development

Chairman: R.H. Parrott

Associate Chairmen: F.C. Green *(Child Health Advocacy)*, D.W. Delaney *(House Staff and Medical Care)*, A.M. Margileth *(Student Affairs)*, J.G. Randolph *(Surgical Division)*

Directors of Divisions: C.A. Rigg *(Adolescent Medicine)*, W.A. Howard *(Allergy)*, F.C. Green *(Ambulatory Medicine)*, L.P. Scott *(Cardiology)*, M.L. Elgart *(Dermatology)*, W. Hung *(Endocrinology)*, D.W. Delaney, *(General*

* Dr. Gallo is Senior Investigator at the National Cancer Institute.

Medicine), S. Leikin *(Hematology)*, R. Chandra *(Anatomical Pathology)*, J.M. Hicks *(Clinical Laboratories)*, G.B. Avery *(Neonatology)*, J.C.M. Chan *(Nephrology)*, S.J. Shelburne, Jr. *(Neurology)*, G.D. Eng *(Physical Medicine)*, J.M. Wiener *(Psychiatry)*, W.J. McSweeney *(Radiology)*, B.S. Epstein *(Anesthesiology)*, J.E. McClenathan *(Cardiovascular Surgery)*, J.G. Randolph *(General Surgery)*, T.H. Milhorat *(Neurosurgery)*, D.S. Friendly *(Ophthalmology)*, D.W. McKay *(Orthopaedics)*, B.M. Webb *(Otolaryngology)*, L.W. Thompson *(Plastic Surgery)*, A.B. Belman *(Urology)*

Professors J.P. Adams, J.G. Randolph, R.H. Parrott, S. Doxiadis *(Visiting)*, S.L. Leikin, A.M. Margileth, B.S. Epstein, G. Avery, D.W. Delaney, W. Hung, L.P. Scott III, R.M. Chanock, D.W. McKay, J.E. McClenathan, W.J. McSweeney, F.C. Green, M. Elgart, T.H. Milhorat, G.D. Eng, J.M. Wiener, G.R. Herer, S.A. Shelburne, Jr.

Clinical Professors L.E. Hoeck, W.A. Howard, S. Berman, S. Ross, W. Stark, M.M. Parks, J.D. Noshpitz, M. Feitel, L. Cytryn, J. Spurlock, S.L. Baker, Jr., A.B. Coleman, R.E. Reiger

Professorial Lecturer M. Jenkins

Associate Professors L.W. Perry, H.B. Richardson, Jr., A.B. Barnet, M. Majd, N. Movassaghi, D.W. Bailey, C.U. Battle, J.C.M. Chan, C.A. Rigg, G.P. August, C.D. Brandt *(Microbiology)*, R.P. Altman, H.W. Kim, D.S. Friendly, B.S. Dunbar, A.B. Fletcher, D.L. Breckbill, L.W. Thompson, M.R.D. Wolf, J.M.B. Hicks, J.W.L. Todaro, G.G. Cochran, A.B. Belman, R.S. Chandra, R. Kurz

Adjunct Associate Professor J.R. Puig

Associate Clinical Professors J.J. McFarland, Jr., S.I. Wolf, B. Olshaker, B.C. Straight, G.J. Cohen, J.J. Francis, A.F. North, Jr., I. Mahdavi, I.B. Bourne, A.J. Modlin, P.C. Brunschwyler, M. Fischer, P.F. Wohlford, H.T. Yates, B.H. Ong, H.R. Gold, J.L. Chamberlain III, K.B. Nelson, C.B. Robinowitz, B.M. Webb, D.J. Fishman

Assistant Professors M.M. Platt, J.H. Wise, B.J. Peacock, D.A. Davis *(Research)*, A.H. Ficker, S.R. Shapiro, R.A. Cahill, R.E. Johnsonbaugh, L.W. Greenberg, M.T. Karna, K.D. Anderson, J.C. Srabstein, S.S. Nason, B. Potter, K. Ravens-croft, Jr., V.A. Argumedo, G.W. Bailey, F.M. Midgley, M.H. Thein, J.A. Tam, P.M. Farrell *(Research)*, M.C. Edwards, A. Fields, P. Holbrook, T.J. Silber, E.J. Distelhorst, Jr., A.M. Glasgow, B. Guller, W.J. Rodriguez, E.S. Ohrlich *(Research)*, B.M. McDonald, S. Amiri, D.R. Brallier, L.A. Covelee, C.B. Feinstein, J.F. Jones, S.P. Kapur, W.A. McGill II, W.L. McLean, D.W. Ochsenschlager, M.G. Saalouke, B. Tsai

Assistant Clinical Professors J.L. Levine, I.D. Milowe, S. Mourat, M.S. Glatt, A.E. Marans, E.S. Denham, D.H. McKnew, Jr., L.A. Cove, M. Engel, M.A.V. Fox, V.L. Guandolo, L. Lefkowitz, J.G. Chopra, S.G. Werner, A.B. Ziens, G.W. Hardman, Jr., G.A. Balfour, D.G. Albert, V.G. Ingram, G.W. Mell, G.A. Tripp, M. Brody, K.L. Kaplan, R. Shearin, F.A. Pedreira, T. Sullivan, E. Taylor, S. Greenspan, R. Evans III, S.B.W. Wooten, C.E.J. Kimball, J.R. Malkin, D.R. Meers, B.A. Shaver, M.L. Renfield, B. Landau, A.H. Stein, P.T. Peebles, M.M. Davis, R.A. Nover, M.A.J. Fox, A.E. Schweitzer, J.M. Burgu, T.M. Connor, J.A. Lowe, M. Ortega, W.J. Hawes, M.S. Albert, J. Barbe

E.C. Esber, J.C. Fallon, M.L. Feldman, G. Joseph, H.A. Mangold, C.A. Renschler, R.L. Steerman, A.R. Ugel

Assistant Professorial Lecturer I.P. Weiss

Instructors R.D. Castro, G.J. Buffone, A.L. Knasel, J.R. Salcedo, G.K. Blackburn, Jr., C.M. Naulty, I.S. Baron-Starke, D.F. Dinges *(Research)*, T. Frey, A. Guarinello, B. Koch, N.C. Luban, C.R. Mock, M.D. Murphy

Clinical Instructors H.H. Diamond, E.A. Black, H.E.C. Millar *(Psychiatry)*, H. Plotsky, D.A. Young, M. Rokni, B.S. Bruner, M.E. Lederman, M.E. Bravo, G.W. Daisley, Jr., V.W.C. Cheng, V. Chusuei, M.J. Guralnick *(Psychology)*, A. Tantisunthorn, R.H. Schwartz, C. Chisholm, M.W. Datch, F.L. Stroud, L.M. Beard, S.C. Goyal, H.L. Kaftarian, R.P. Dickey, R.R. Cioletti, M.G. Walten, Jr., C.A.B. Schulman, K.Z. Fowler, E.A.G. Pinder, M.D. Smokvina, G.M. Korengold, H.T. Vollero, J.D. Blake, I.M. Chatoor-Koch, R.H. Coleman, R.A. De Vine-Curio, P.R. Littleton, K.N. Rosenbaum

Special Lecturers J.A. Bottiglione, C.J. Schulte III, J.W. Oberman, R.F. Hinckley, C.M. Berlin, Jr., M.I. Mones, L.L. Kulczycki, M. Schuelein, J.A. Kenney, Jr., M.I. Michael, J.L. Sever, P. Hamosh, I. Seiler, J.H. Bayly, E.G. Moses, C.E. Streetman, Jr., E.J. Feroli

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Arrangements to enroll in child health and development courses should be made with the instructor prior to registration.

*303 **Pediatric Clerkship** (10) — Todaro

Full-time, as part of resident team; ward rounds; work in outpatient department and specialty clinics under staff supervision; child psychiatry and child guidance, lectures, clinical conferences, grand rounds. Children's Hosp. (Annual, continuous 8-week rotation)

373 **Pediatric Urology** (5) — Belman

Participation in clinical approaches on an inpatient and outpatient basis. Assessment, diagnostic evaluation and the participation in surgical problems. 4-week elective periods. Children's Hosp.

375 **Pediatric Surgery** (5) — Randolph

Participation in an active, closely supervised surgical service for infants and children, including congenital defects, cardiac surgery, trauma, and neoplasms. 4-week elective periods. Children's Hosp.

376 **Pediatric Neurology** (5 or 10) — Shelburne

Participation in diagnostic and therapeutic studies on inpatients and outpatients. Rounds, conferences, seminars. 4- or 8-week elective periods. Children's Hosp.

377 **Community Health Development** (5 or 10) — Hinckley

Acquaintance with public health preventive and community medicine as it is conducted by the Montgomery County, Md., Health Department. Opportunity to work in outlying health centers and central pediatric specialty clinics. Familiarization with school health programs and projects. 4- or 8-week elective periods.

* Required for medical students.

378 **Genetics** (5)

Principles of basic human genetics with emphasis on the dysmorphic child, chromosomal aberrations and genetic counselling. Opportunity to work in the genetic laboratory and to learn chromosomal techniques. 4-week elective periods. Children's Hosp.

379 **Pediatric Intensive Care** (5) Holbrook, Fields

Clinical and didactic material on the pathophysiology and treatment of life-threatening illnesses, conditions, or injuries in childhood. Limited patient responsibility, extensive patient contact. Night call arranged individually. 4-week elective periods. Children's Hosp.

380 **Clinical Pediatrics** (5) Todaro

Full-time, as part of resident team; wards, outpatient department, and specialty and emergency clinics under staff supervision. Participation in diagnostic studies, therapeutic procedures, rounds, and conferences. Acting internships are available. 4-week elective periods. Children's Hosp

381 **Pediatric Allergy** (5 or 10) Howard

Introduction to pediatric allergy; clinics and wards. Some experience in experimental techniques and preparation of extracts. 4- or 8-week elective periods. Children's Hosp.

382 **Pediatric Radiology** (5) McSweeney

Diagnostic and therapeutic radiology in infants and children; special diagnostic procedures. 4-week elective periods. Children's Hosp.

383 **Cystic Fibrosis** (5)

Detailed diagnosic and therapeutic procedures including pulmonary and nutritional manifestations and complications in cystic fibrosis patients from the newborn to those in their third decade. Medical, surgical, psychological, and social problems of cystic fibrosis patients and their families. 4-week elective periods. Children's Hosp.

384 **Newborn and Premature** (5) Edwards

Principles and practices of neonatology emphasizing basic physiological processing; their relationship to normal development and to diseases in the newborn period. 4-week elective periods. Univ. Hosp.

385 **Child Psychiatry** (5) Wiener

Observation of and appropriate participation in diagnostic, consultative, and follow-up work with hospitalized children and psychiatric outpatients. Clinical and theoretical conferences. Orientation to community child psychiatry and child mental health as part of service delivery system. 4-week elective periods.

386 **Pediatric Hematology** (5) Leikin

Clinical and laboratory studies of infants and children with hematologic disorders; bone marrow examinations. 4-week elective periods. Children's Hosp.

387 **Clinical Pediatrics** (5) Stev

Care of newborn and children on inpatient basis; diagnostic studies, therapy; assigned reading. 4-week elective periods. Fairfax Hosp.

388 **Newborn Medicine** (5) Avery, Fletcher

Observation and participation in the care of infants. 4-week elective periods. Children's Hosp.

389 **Pediatric Cardiology** (5) L. Scott, Perry

Physical diagnosis of congenital and acquired heart diseases, interpretation of electrocardiograms and vectorcardiograms, cardiac catherizations. 4-week elective periods. Children's Hosp.

390 **Extramural Pediatric Elective** (arr.)

The department makes arrangements for students to spend elective periods at other institutions. Interested students should contact Dr. Jane Todaro after they have obtained the following: (1) a letter of approval from the Dean for Academic Affairs, (2) a description of the course or courses to be taken, and (3) a description of the affiliations of the other institution.

393 **Pediatric Anatomical Pathology and/or Clinical Pathology** (5) Hicks, Chandra

Participation in necropsy and surgical pathology service. Clinical correlation of histopathology, laboratory studies, and clinical disease. 4-week elective periods. Children's Hosp.

394 **Pediatric Clinical Laboratory** (5) Hicks, Margileth

Laboratory studies of infants and children correlated with clinical disease. In-depth review of laboratory diagnostic studies. 4-week elective periods. Children's Hosp.

395 **Endocrinology** (5) Hung, August

Evaluation of patients with metabolic and endocrine disorders. Planning diagnostic and therapeutic programs for patients in an office setting and possibly for inpatients. 4-week elective periods. Children's Hosp.

396 **The Handicapped Child and Chronic Disease** (5) Battle

Care of the handicapped child in a clinical situation and through tutorial readings. 4-week elective periods. Hosp. for Sick Children.

397 **Nephrology** (5) Salcedo

Training in clinical nephrology and hemodialysis; research opportunities in vitamin D metabolism, acid-base physiology, intravenous nutrition, renal physiology, and calcium metabolism. 4-week elective periods. Children's Hosp.

398 **Comprehensive Care** (5 or 10) Oberman

Participating in both sick- and well-child care as administered in a comprehensive setting; experience in multidisciplinary approach; cooperative planning with other community agencies. 4- or 8-week elective periods. Comprehensive Health Care Program.

399 **Community Pediatrics** (5) Greenberg

For students primarily interested in private pediatrics practice. Care in the nursery and pediatric ward of a community hospital; exposure to private pediatrics practice in an office setting. 4-week elective periods. Holy Cross Hosp.

Clinical Engineering

Chairman: W.S. Yamamoto

Professors W.S. Yamamoto, H.V. Pipberger, B. Waxman *(Visiting)*, J.J. Feffer
Adjunct Professors C.E. Huckaba, J.K. Weston, L.E. Lipkin
Professorial Lecturer B. Kemp
Associate Professor R.A. Dunn *(Research)*
Assistant Professors A. Berson *(Research)*, H.Z. Pipberger *(Research)*, U.E. Ruttimann, F.H. Orthner, R. Bassir
Assistant Clinical Professor P.R. Moyer

101 **Practical Computing for New Health Practitioners** (3) Staff
(Formerly Practical Computing for Paramedics)
For students majoring in radiologic science and administration. Designed to familiarize the student with a computer system.

201 **Theory of Medicine** Staff
Required course for first-year medical students, covering selected topics in biostatistics, epidemiology, decision theory, and cost-benefit analysis, as applicable to the practice of medicine.

351 **Clinical Engineering for Medical Students** (5) Staff
Students will be assigned for tutorial instruction in the principles and practices of clinical engineering. Participation in current laboratory projects, assigned reading and study. Participation in the Health Care Technology Seminar is required. Students should have basic knowedge of mathematics or physics, or some prior exposure to engineering disciplines. Consultation with the staff is required prior to enrollment. 4-week elective periods. Warwick Bldg.

353 **Medical Computing** (5 or 10) Staff
Aspects of computer usage, including preparation and execution of programs which involve clinical or research applications, such as ECG analysis, pulmonary function calculation, medical file management, mathematical modeling, data processing, and managerial computing. In some cases, the staff may be able to supervise a student in an area of the student's choice; in general, however, the program will consist of formal classroom instruction and individual study. Participation in the Health Care Technology Seminar is required. 4- or 8-week elective periods (may be taken in two divided 4-week periods). Warwick Bldg.

354 **Automated Medical Measurement Systems** (5) Staff
Under supervision, the student will work in the daily operation of a multiphasic screening clinic and participate in the process of new implementations and in evaluation of the system. Review of variability of clinical findings and the problems of the variability of clinical observation. Participation in the Health Care Technology Seminar is required. 4-week elective periods. Warwick Bldg.

390 **Extramural Clinical Engineering Elective** (arr.) Staff
The department sponsors students spending one or more elective periods

at other institutions. Interested students must have the approval of the chairman of the department.

Dermatology

Chairman: M. Elgart

Professors R.S. Higdon *(Emeritus)*, M. Elgart
Associate Clinical Professors W.M. Narva, O.G. Rodman, C.S. Brown, T.P. Nigra
Assistant Professor M. Braun III
Assistant Clinical Professors P.L. Repetta, Jr., D. Mitchell, L.J. Eanet, M.L. Turner, D.M. Cryan, S.H. Berk, R.A. Katz, D.N. Robins, A.R. Ugel
Clinical Instructors H.S. Golomb, R.N. DeAngelis, D.L. Pierson
Special Lecturers N. Kanof, J.A. Kenney, Jr.

380 **Dermatology Clinic** (5) — Elgart

Conferences, lectures, and attendance at dermatology clinic where patients with wide variety of dermatoses are seen. Diagnosis and treatment of common skin disorders. Dermatologic surgical procedures, technique for using liquid nitrogen, culture and identification of fungi, microscopic diagnosis of common cutaneous diseases. 4-week elective periods. Univ. Ambulatory Care Ctr.

381 **Dermatology Clinic** (5) — Turner

Same as Derm 380. 4-week elective periods. Group Health Asso., Inc.

382 **Dermatology Clinic** (5) — Rodman

Same as Derm 380. 4-week elective periods. Walter Reed Gen. Hosp.

383 **Dermatology Clinic** (5)

Same as Derm 380. 4-week elective periods. Andrews Air Force Base Hosp.

384 **Private Office Practice** (5) — Repetto

4-week elective periods.

385 **Private Office Practice** (5) — Eanet

4-week elective periods.

386 **Private Office Practice** (5) — Robins

4-week elective periods.

387 **Clinical Dermatology** (5) — Fischman*

Introduction to clinical dermatology, by working in the out-patient dermatology clinic, observing in-patient consultations, reviewing histopathology,

* Dr. Fischman is Chief of the Dermatology Service at the Veterans Administration Hospital.

performing skin biopsies. Close supervision by staff. Interview required. 4-week elective periods. VA Hosp.

388 **Dermatology in General Medicine** (5) Nigra

Dermatology as related to internal medicine. Mechanisms of diseases; in-depth approach to dermatologic-medical problems; advanced reading. 4-week elective periods. Wash. Hosp. Center.

390 **Extramural Dermatology Elective** (arr.)

The department makes arrangements for students to spend 4-week elective periods at other institutions. Interested students should contact the chairman of the department.

391 **Private Office Practice** (5) Golumb

4-week elective periods.

392 **Private Office Practice** (5) DeAngelis

4-week elective periods.

Health Care Sciences

Acting Chairman: T.E. Piemme

Professors T.E. Piemme, F.C. Green

Professorial Lecturer R.S. Hanft

Clinical Professor A.B. Rosenbaum

Associate Professors M. McCally, R. Keimowitz, J. LaRosa, S. Marinoff

Associate Clinical Professors P. Birk, S.J.N. Sugar, W.J. Washington, Jr.

Associate Professorial Lecturer J.L. Falkson

Assistant Professors J.M. Wise, M.R. Silverman, B.B. Doyle, P.J. Steinglass, G.W. Bailey, L. Sank, N.W. Lindenmuth, A.W. Stone, J.O. Jason, N.W. Matheson *(Research)*, L.G. Pawlson, R.M. Shannon

Assistant Clinical Professors G.A. Ellsworth, S.F. Fiscina, J.K. Cooper, J.C. Fallon, E. Gottlieb, J.D. Hines

Assistant Professorial Lecturers J.K. Miller, C.J. Savarese, S.E.H. Raviv

Instructors K.R. Sorem, W.A. Stein, K.R. Katterjohn, J. Shapiro, G. Merriweather, M.S. Donaldson *(Research)*, A. Guarinello, C.E. Streetman, Jr.

Adjunct Instructor J.E. Ostrander

Clinical Instructors N.T. Connally, V.T. Miller, R.A. Berenson, J.M. McGinnis, E.B. Hume, V.V. Kalbian, J.V. Dichoso, W. Knaus, J.C. Arnett, Jr., V.B. Behari, D. Chua, L.D. Ehrlich, J.A. Noronha

Special Lecturers J.W. Argent, Jr., D.G. Birdwell, W.H. Brigge, C.W. Buchan, V.D. Buechler, J. Carlisle, Jr., J.D. Chapman III, W.R. Chiarulli, A.P. Colburn, E.F. Crabtree, D.E. Deliz, Sr., J.S.M. Dimapilis, K. Goanos, J.L. Haythe, M.K. Howell, Jr., E.E. Jones, A.E. Keen, J.H. Lamkin, H.N. Larsen, J.B. Laskowski, J.P. Marceau, A.F. Marin, S.L. McCourt, L.E. McGuire, J

Monica, C. Munson, J.L. Preston, R.H. Price, G. Rivers, F.E. Rollins, E.M. Strehlau, E.M. Taft, P.E. Trievel, J.A. Watling, R.E. Webber, J.N. Wray, R. Wynn

Courses numbered from 10 through 96 are limited to military personnel in off-campus health sciences programs.

10 **Anatomy and Physiology** (3) Staff
(Formerly two credits)
Study of the human body: esteology, arthrology, myology, hematology, immunology; circulatory, respiratory, digestive, endocrine, excretory, nervous, and reproductive systems.

11 **Applied Anatomy and Physiology** (6) Staff
Application of anatomical and physiological principles. Control of hemorrhage, methods of resuscitation, management of shock, relief of pain; physical examination, nutrition, fluid and electrolyte balance, respiratory conditions, childbirth.

15 **Pharmacology and Toxicology** (5) Staff
Medicinal substances used in treating people: pharmaceutical mathematics, terminology, preparations, compounding, physiological action and potential toxic reactions of certain drugs, legal aspects of drug regulations.

16 **Clinical Laboratory Techniques and Procedures** (arr.) Staff
(Formerly two credits)
Laboratory procedures used in basic health maintenance. Use of microscope, complete blood count, acid-fast stain, urinalysis, blood sedimentation rate, RPR card test, coagulation and bleeding time, blood grouping, blood typing.

22 **Introduction to Epidemiology** (2) Staff
Study of common communicable diseases, immunologic factors, and procedures. Contact interviewing and reporting of the communicable diseases.

67 **Disaster Sanitation** (2) Staff
Survey of nuclear, biological, and chemical hazards; emphasis on detection, personnel protection, and related functions.

68 **Environmental Sanitation** (3) Staff
Study of certain environmental factors which contribute to human health. Food, water, living and working spaces, economics, and pest control.

92 **Medical Material Management** (3) Staff
(Formerly five credits)
Material management in the medical facility. Budget and budgeting process, expense operating budget, purchasing, material receipt and inspection, inventory of equipment and supplies, controlled medicinals, stock record cards, surveys and adjustments, classes of plant property, property accountability, storage requirements.

93 **Health Systems Administration I** (4) Staff
Health systems organization. General office procedures, basic typing methods, standard subject identification codes, filing procedures, records disposal, security of patient information, correspondence, procedural manuals.

94 **Health Systems Administration II** (4) Staff

Planning office systems, procedures, environment, and location. Quality control, work measurement methods, authority and organizational relationships, principles of office organization, employee supervision.

95 **Records Management** (6) Staff

Public health records management. Classification of personnel, personnel records, promotions, educational services, career development, personnel orientation, medical care eligibility, patient data systems, statistical analysis.

96 **Clinical Experience** (arr.) Staff

(Formerly Clinical Experience: Medical Service Technology [6])

Supervised experience and research. Application of principles learned in didactic experience to the practical situation.

102 **Food and Water Sanitation** (4) Staff

General characteristics of urban and rural water systems, treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Dairy products and food sanitation. Processing, storing, and distributing food. Supervision and training of food industry personnel.

109 **Human Behavior I** (2) Doyle

Theory and techniques of effective communication with patients; counseling and psychotherapy. (Fall)

110 **Structure of the Human Body** (3) Staff

Lecture, film, and demonstration. Gross and microscopic makeup of the human body covering the major organ systems: cellular, musculoskeletal, nervous, endocrine, cardiovascular, respiratory, gastrointestinal, urinary, reproductive, and integrated.

113 **Medicine and Society** (1) Staff

Survey of the history of medicine, medical ethics, sociological and anthropological aspects of medical practice, major issues facing modern medicine in the United States. (Fall)

116 **Medical Terminology** (arr.)

(Formerly one credit)

Terminology and vocabulary basic to all areas of medical science, hospital services, and allied health specialties. (Fall) Staff

119 **Introduction to Patient Care I** (arr.)

(Formerly one credit)

Patient histories, routine physical examinations, use of routine clinical examination equipment. (Fall) Staff

125 **Manifestations of Disease** (arr.)

(Formerly eight credits)

Pathologic and abnormal structure and function encountered in clinical disease states. Functional approach to clinical medicine, including signs, symptoms and diagnosis of disease states. Prerequisite: HCS 110, 112, Phyl 111. (Spring) Staff

131 **Human Behavior II** (2)

Continuation of HCS 109. Prerequisite: HCS 109. (Spring)

134 **Introduction to Patient Care II** (2) **Staff**
(Formerly three credits)
Continuation of HCS 119. Prerequisite: HCS 119. (Spring)

137 **Issues in Health Care** (1) Pawlson
(Formerly Dynamics of the Life Cycle)
Issues surrounding the more controversial topics in modern health care delivery. (Spring)

140 **Clinical-Pathological Correlation** (0) Piemme
Three hours a week for 20 weeks. Format for case presentations and proper methods for clinical integration of signs and symptoms of disease. Prerequisite: HCS 116. (Spring)

142 **Nurse Practitioner Seminar I** (2) Silverman
Family dynamics, role resocialization, and current issues influencing development of the nurse practitioner role.

143 **Nurse Practitioner Seminar II** (3) Silverman
Continuation of HCS 142.

144 **Nurse Practitioner Seminar III** (1) Silverman
Continuation of HCS 142 and 143.

145 **Management of Primary Care Problems** (2) Staff
Common office pediatric and adult medicine problems. Lectures, case presentations, and audiovisual presentations.

146 **Surgical and Diagnostic Procedures** (0) Staff
(Formerly three credits)
Fundamentals for performing several diagnostic and surgical procedures. Basics for preparation and execution of procedures such as venipuncture, suturing, intravenous infusion. Proper surgical decorum, development of working knowledge of various surgical instruments and sutures. (Spring)

147 **Introduction to Radiology** (1) Staff
(Formerly two credits)
Emphasis on basic language, science, and principles of radiology, including such aspects as safety, positioning, protection-requesting studies, etc. Basic elements of topographic anatomy as applied to radiology. The differentiation of abnormal from normal on chest, abdominal, and extremity films. Basic pattern recognition along with a systematic approach to each x-ray interpretation. (Fall)

148 **Introduction to Electrocardiography** (1) Staff
(Formerly two credits)
Emphasis on the performance of a technically competent electrocardiogram by each student. Basic theory behind electrocardiography as well as interpretation of basic EKG patterns. Common errors of taking and reading EKGs. Identification of common normal and abnormal wave patterns on EKGs. Value and appropriate use of echocardiography and phonocardiography. Principles of performing simple exercise tolerance testing.

150 **History-taking Review and Theory** (0) Staff
(Formerly one credit)
Theories of taking, presenting, and writing a competent history; e.g., traditional approach, problem-oriented approach. Techniques for gath-

ering important, yet potentially embarrassing and threatening, areas of the patient's history. Discussion and direct use of a variety of techniques and approaches for collecting historical information from different types of patients. Opportunities for live, observed patient interviews, constructively evaluated. Discussion of oral and written presentation of histories taken outside class.

Staff

151 **Clinical Pharmacology** (2)

Day-to-day clinical situations for discussion of the appropriate use of some of the more common drugs in a primary care practice. Dosages, actions, routes of administration, indications, and contraindications as applied to specific clinical examples. Advantages, disadvantages, and reasons for deciding on the primary drug and possible alternative therapy. When and how to use *PDR*. Review and discussion of the importance and advantages of taking an accurate and complete drug history. Prerequisite: Phar 158. (Summer)

Staff

153 **Gynecology Outpatient: Nurse Practitioner** (3)

Three-week required rotation for nurse practitioner students. Management of gynecological problems in ambulatory setting.

Silverman

154 **Independent Study** (arr.)

(Formerly Psychiatric Outpatient: Nurse Practitioner [2])

Elective rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

Staff

157 **Primary Care Preceptorship: Nurse Practitioner** (6)

Six-week required rotation for nurse practitioner students. All aspects of patient management in ambulatory setting.

Staff

160 **Medical Inpatient** (5)

(Formerly four credits)

Six-week hospital rotation required for physician's assistant students. Case presentations. Students attend all conferences and have overnight duty.

Staff

163 **Medical Outpatient** (5)

(Formerly four credits)

Required for physician's assistant students. Six-week rotation at ambulatory care facility. Students attend all conferences and make case presentations.

Staff

165 **Medical Outpatient: Nurse Practitioner** (arr.)

Required rotation for nurse practitioner students, arranged with approval of advisor. All aspects of patient management in ambulatory setting.

Staff

166 **Surgical Inpatient** (5)

(Formerly four credits)

Required for physician's assistant students. Six-week rotation in hospital surgical division. Management of pre-operative and post-operative surgical inpatients. Students attend all conferences and make case presentations.

Staff

169 **Obstetrics and Gynecology** (5)

(Formerly four credits)

Six-week hospital rotation required for physician's assistant students.

Case presentations, regular duty, and attendance at all conferences required.

170 **Obstetrics: Nurse Practitioner** (2) Staff
Two-week elective rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

171 **Pediatric Outpatient: Nurse Practitioner** (3) Staff
Three-week rotation for nurse practitioner students. Ambulatory pediatric practice.

172 **Pediatric Outpatient** (5) Staff
(Formerly four credits)
Six-week rotation required for physician's assistant students. Ambulatory pediatric practice. Attendance at all conferences and case presentations required.

175 **Primary Care Preceptorship** (arr.) Staff
(Formerly 12 credits)
Required rotation for allied health students. All aspects of primary care medicine. Hospital rounds with attending physicians.

178 **Emergency Medicine** (5) Staff
(Formerly four credits)
Required for physician's assistant students. Six-week rotation in hospital emergency ward. Attendance at all conferences and case presentations required.

179 **Emergency Medicine: Nurse Practitioner** (2) Staff
Two-week rotation required for nurse practitioner students. Medical and surgical emergency management problems.

180 **Practicum in Environmental Health** (10) Staff
(Formerly 12 credits)
Supervised fieldwork. Food service, housing, water, sewage and solid waste, and infectious diseases. Occupational health problems. Reports and conferences.

193 **Issues in Aging** (3) Boren
Seminar on the nature and problems of aging, including social, biological, economic, legal, and health care needs. Guest lecturers include professors from several University schools and experts from affiliated institutions and the community. Designed primarily for graduate students in the social sciences and health care administration and for students in the medical school. (Fall and spring)

194 **Practicum in Gerontology and Geriatric Care** (arr.) Staff
Supervised fieldwork with the elderly or in administration and planning for the elderly. Offered in cooperation with other schools and departments of the University. Primarily for undergraduate and graduate students in the social sciences and health care administration, and for students in the medical school pursuing the B.S. with a concentration in gerontology degree. Open to others with departmental approval. (Fall and spring)

195 **Second Careers in Health Care** (arr.) Boren
(Formerly Second Careers in Allied Health)
Lectures, discussions, and fieldwork (eight to 12 hours per week) designed to help older students who are seeking second careers in the health field to make realistic career choices. Health care career and training opportunities and personnel needs. (Fall and spring)

196 **Issues in American Health Care** (arr.) McCally
Fieldwork combined with academic study of the present American health care system and its problems: cost, quality of care, delivery of care, ethical issues, health education, consumer issues. Field placements (12-20 hours per week) in appropriate health-related activities. Admission by permission of instructor. (Fall and spring)

198 **Psychiatry** (5) Staff
(Formerly four credits)
Six-week clinical rotation required for physician's assistant students. Case presentations and attendance at all conferences required.

199 **Independent Study** (5) Stein
(Formerly four credits)
Four-week required rotation in area chosen by individual student. Objectives for chosen area determined before enrollment. Advisor's approval required for area of study and learning objectives.

301 **Clerkship in Primary Care** Staff
For third-year medical students. Care of patients in ambulatory setting. Includes participation in University's prepaid health plan (HMO), emergency room, and office practice of general internists, general pediatricians, and family practitioners. Emphasis on specialty skills which contribute to physician's capacity to care for common minor illnesses. Office practice of orthopaedics, otolaryngology, dermatology, and ophthalmology. Participation with District of Columbia Fire Department in responding to ambulance calls. Lecture series provides foundation for office management of common illnesses managed in ambulatory setting. 8-week elective periods throughout the academic year.

350 **Ambulatory Health Care** Piemme
For senior medical students. Research or clinical experience in primary medical care. 4- or 8-week elective periods during which students participate in projects such as medical audit, study of organization of health services, and problems of underserved populations. Exchange with similar program in other institutions is possible, especially for those participating in model family practice units.

360 **Emergency Health Care** Piemme
For senior medical students. Assignment to an emergency room in the District of Columbia. Instruction by full-time and resident emergency room staff. Emphasizes cardio-pulmonary resuscitation and management of trauma, drug overdose, coma, and common illnesses and injuries in emergency care setting. 4-week elective periods. Limited to two students per period.

370 **Mental Health Provision in the Primary Care Setting**
For senior medical students who seek clinical experience in a multi-disciplinary mental health practice, with emphasis on the short-term treatment

of patients commonly presenting in a primary care setting. Students are exposed to such problems as sexual dysfunction, depression, and psychosomatic symptoms as they are presented in an ambulatory care setting. The student is given the opportunity to perform initial evaluations, observe groups, follow patients, and provide consultation to primary care teams. Limited to one student per session for a minimum 6-week elective period.

390 **Extramural Health Care Sciences Elective** (arr.)

The department makes arrangements for students to spend one or more elective periods at other institutions. Approval of the department chairman required.

Interdisciplinary Courses

First-year medical students are required to take two interdisciplinary courses: Idis 211 *The Cell in Medicine*, administered by the Departments of Anatomy, Biochemistry, and Physiology; and Idis 212 *Neurobiology*, administered by the Departments of Anatomy and Physiology.

211 **The Cell in Medicine** **Staff**

Same as Anat 211 and Phyl 211. Integrated survey of the structure, function, and metabolism of the cell.

212 **Neurobiology** (5) **Staff**

Same as Anat 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory.

Clinical Sciences, an interdisciplinary program, is required of medical students in the second year. By means of panel discussions, lectures, seminars, case presentations, demonstrations, and examinations of patients, it provides students with basic instruction in various clinical subjects and prepares them professionally and personally for the clinical clerkships and career electives in the third and fourth years. The program is coordinated by a task force appointed by the Committee on Educational Policy of the School of Medicine and Health Sciences. The task force consists of representatives from the departments responsible for teaching courses in the program: Robert Keimowitz *(Chairman)*, Department of Medicine; H.G. Mandel, Department of Pharmacology; Winfield Scott, Dean's Office; F.N. Miller, Jr., Department of Pathology; Brian Doyle, Department of Psychiatry and Behavioral Sciences; and Dennis Glick, second-year student. In addition to Idis 301 (see below), the program consists of Path 201, Phar 201, and Pchi 201.

230 **Introduction to Health and Patient Care** (2)

One-year course. Four major components: *Emergency Medicine*—12 didactic sessions; skills of elementary emergency medicine and first aid; laboratory in cardiopulmonary resuscitation. *Issues in Health Care*—12 sessions; lecture, symposium, and discussion; introduction to critical issues in the rapidly changing American health-care system; organization of health care, medical economics, medical education, quality of care, ethics, and related issues. *Communication Skills*—nine small-group lab-

oratory sessions; interpersonal communication skills upon which clinical interviewing and counseling are based; filmstrip demonstrations of effective listening skills and video-tape recall of role-played interviews. *Normal Physical Examination*—four laboratory sessions; opportunity to learn techniques of normal physical examination.

301 **Introduction to Clinical Medicine** (16) Staff

One-year course. Integrated, organ-oriented course. Fundamental instruction in anesthesiology, child health and development, dermatology, gynecology, internal medicine, neurology, obstetrics, ophthalmology, psychiatry, radiology, and surgery; emphasis on physical diagnosis and laboratory medicine. Includes Life Cycle, dealing with the interpersonal relationships of the physician and patients and their families.

Medical and Public Affairs

Chairman: M. Head

Professor M. Head

Associate Professors F.J. Kavanaugh *(Research)*, R.H. Ross *(Research)*

Assistant Professors E. Waters, Jr. *(Research)*, J. Heller *(Research)*, I.C. Mohler, Jr. *(Research)*, S.S. Rogers *(Research)*, H.K. Kolbe *(Research)*

351 **Forensic Medicine** (2) Sharpe,* Head, Fiscina

Open to 2nd-year medical students. Problems arising when the professional interests of lawyers and physicians overlap. Malpractice, personal injury litigation, licensure and discipline, ethics and economics, hospitals and other institutions, and compelled treatment. (Fall)

Medicine

Acting Chairman: J.C. Rios

Directors of Divisions H.E. Ratcliffe *(Allergy)*, G.A. Kelser, Jr. *(Cardiology)*, W.O. Dobbins III *(Gastroenterology)*, L.S. Lessin *(Hematology-Oncology)*, C.U. Tuazon *(Infectious Diseases)*, K. Wipplinger *(Internal Medicine)*, K.L. Becker *(Metabolic and Endocrine Diseases)*, S.V. Spagnolo *(Pulmonary Diseases)*, I.G. Tamagna *(Rehabilitation Medicine)*, A.E. Parrish *(Renal Diseases)*, W.R. Felts, Jr. *(Rheumatology)*

* Dr. Sharpe is Professor of Law in the University's National Law Center.

Professors M.J. Romansky, J.M. Evans, C.S. Tidball *(Research)*, A.E. Parrish, F.W. Wolff, I.G. Tamagna, J.J. Feffer, T.E. Piemme, L. Bernstein, G.A. Kelser, Jr., H.V. Pipberger, H.J. Zimmerman, J.A. Curtin, R.P. Kaufman, T.O. Cheng, F. Leonard *(Research—Rehabilitation Medicine)*, W.O. Dobbins III, J.M. Bacos, E.R. Simon, A.C. Hollinshead *(Research—Pharmacology)*, N.C. Kramer, J.D. Finkelstein, L.S. Lessin, W.P. Baker, W.M. Lukash, J. Sode, D. Reiss, K.L. Becker, W.F. Barth, V.T. DeVita, G.D. Eng, I.I. Hsu, M. Mourad, L. Pierce, H.E. Ratcliffe, J.N. Sheagren, D. Castell, M. Elgart, F.M. Muggia, R.C. Reba, J.C. Rios

Clinical Professors J.J. Rheingold, T.S. Sappington, A.B. Rosenbaum, T.J. Greenwalt, M.H. Stolar, C.W. Thompson, M. Gusack, E.P. Parker III, H.M. Silver, S.D. Loube, M. Fuchs, B. Nelson, H.L. Kamenetz, F.J. Murray

Adjunct Professor J.P. Naughton

Professorial Lecturers W.C. Roberts *(Cardiology and Pathology)*, S.M. Fox III, D.S. Fredrickson

Associate Professors W.R. Felts, Jr., J.B. O'Connell, K. Wipplinger, M.J. Jackson *(Research)*, P.A. Gorman, J. Stengle, W.H. Scott, P. Witorsch, R. Keimowitz, J. LaRosa, C.M. Voyles, D.S. O'Leary, G.P. Schechter, W.P. Fortune, M.S. Gold, R.B. Johnson, S.V. Spagnolo, J.E. Zimmerman, G.S. Folsom *(Research)*, P.M. Berkman, W.S. Chiu, C.Y. Chuang *(Visiting)*, P.P. Klug

Adjunct Associate Professor L.W. Marshall

Associate Clinical Professors J.W. Latimer, Jr., H.D. Ecker, C.W. Jones, M. Mensh, M.H. Rosenberg, J. Kleh, J.P. Mann, E. Adelson, A. Ruskin, L.J. Thomas, W.O. Bailey, Jr., R.B. Benedict, S.W. Kirstein, I. Kessler, W.D. Brill, C.A. Schulman, A. Baer, J.M. Pisani, S.W. Bush, J. King, M.H. Jacobson, R. Standard, E.J. Leonard, J. Fenton, P. Birk, R.B.W. Smith, L.B. Hobson, S.H. Danovitch, A.W. Danish, A.A. Lear, O.W. Donnelly, S.J. Talpers, R. Scalettar, R.S. Wilkinson, M.S. Wolfe, D.A. Morowitz, N.L. Christopher, G.H. Nachnani, R.A. Fischer, R.M. Kaufman, M.J. Stern, N.P. Trujillo, L.M. Weiss, R.K. Sarin, D. Ein, D.A. O'Kieffe, J.R. Shapiro, P.V. Holland, S.J. Wolin, W.J. Tompkins, J.B. Calatayud, B. Grand, D.R. Rosing, H.C. Sadin, J.W. Walsh

Associate Professorial Lecturers J.C. Penhos, R.R. Blanck

Assistant Professors C.H. Chan, D.H. Goodman, M.H. Cohen, J.F. Meyer, A.M.S. Thompson, R.A. Goldstein, S.H. Mendelson, A. Guha, B.E. Fossieck, Jr., A.L. Ginsberg, H.J. Gorfinkel, H.B. Marsh, K.H. Chase, D.B. Gail *(Research)*, B. Arling, F.H. Corcoran, R.D. Gaskins, L.P. Georges, K. Goldstein, E. Perlin, I. Scher,, K. Mallik *(Research)*, L.L. Vertuno, O.C.L. Silva, P. Cohen, N.W. Lindenmuth, A.N. Amigable, S.E. Anderson, Jr., L.D. Bohan, D.F. Fragnul, J.P. Kirchner, L.W. Raymond, A.H. Rowberg *(Research)*, A.W. Stone, C.V. Tuazon, E.C. Flores, J.C. Donaldson, M. Braun III, O.M. Cobb, Jr., J.H. Gaskin, R.P. Jacobs, W. Kurland, M.H. Lin *(Research)*, J.S. Putnam, R.C. Saunders, S. Scott, Jr., M. Stock, B.L. Strauss, C.S. White III

Assistant Clinical Professors D. Horwitz, S.T. Gibson, M.H. Rose, A. Friedman, J.W. Long, T.L. Hartman, B. Rabkin, L.A. Craig, Jr., A. Seltzer, C.E. Law, Sr., H.O. Mott, N.H. Rubenstein, B.H. Ostrow, W.R. Ehrmantraut,

G.A. Chapman, S. Babin, Jr., J. Crowell, F.K. Harris II, R.F. Dyer, H.I. Passes, R.S. Poole, W.L. Hall, M.A. Sislen, G.T. Economos, I. Ardam, S.E. Barr, H.A. Moskovitz, J.T. Hagenbucher, G.N. Polis, J.P. Lucas, F. Chucker, L.H. Biben, W.H. Harvey, W. Kurstin, L.H. Fenton, P. Schlein, D.J. Hand, P.A. Haber, G. Balsamo, G.J. Thorpe, C. Rudzki, H.C. Singer, E.B. Thompson, R. Schoenfeld, M.M. Shefferman, A.M. Mondzac, B. Kotelanski, R.J. Karpick, M.S. Maillis, W.Y.K. Goo, M.J. Halberstam, J.F. Mermel, S.N. Richman, T.P. Dwyer, S.M. Fidler, A. Muller, R.A. Ratner, A. Segal, B.L. Manalo, P.G. Ventry, M.J. Haut, R.A. Nicklas, R.F. Cioffi, F. Meyers, R.W. Turner, S.A. Schwartz, L.F. Barker, D.D. Haut, A.J. Anderson, P.P.L. Chang, H.S. Mirsky, M. Donowitz, J.A. Kark, J.N. Ramey, D.B. Simon, R.A. Noble, H.A. Schwartz, G.R.G. Werth, P. Assatourians, C.J. Bier, J. Brandes, R. Evans III, D.L.B. Goldberg, S.G. Goldberger, A.A. Oboler, M. Phillips, J.D. Robinson, G.W. Ward, Jr., I. Weiszer, B. Hecht, J. Fatemi, D. Yoo, C.B. Abrams, L.F. Bentolila, S.H. Berk, K.J. Dickie, M. Enders, L.J. Eron, A. Frank, S.D. Goldberg, M.A. Herman, J.E. Howard, J.C. Mulhauser, A.A. Nimetz, R.J. Osheroff, D.N. Robins, J.C. Seymour, A.B. Shauer, B.E. Sherwin, T.G. Sinderson, B.K. Singh, J.T. Solano, J. Taubin, M.L. Turner, H.N. Wall

Instructors R.E. Rose *(Research)*, A.G.S. Fry *(Research)*, R.A. Muesing *(Research)*, T.V. Kuzmowych

Clinical Instructors N.K. Bohrer, N.G. Goodman, L. Ruckstuhl, R. Kramer, D.W. Datlow, R.M. Huffman, L.P. Appel, N.T. Connally, J.C. Perkins, H.J. Alpert, S.R. Rishi, I. Spector, D. Ramaswamy, D.F. Millon, N.A. Crane, N.S. Otchin, B. Choi, N. Mendjuk, P.S. Spiegler, V.T. Miller, I.V. Magal, J.M. McGinnis, N.E.S. Falk, T.C. Havell II, M Kavalier, M.G. Mukhopadhyay, B.P. Tinker, A.L.B. Williams, N. Gonzalez, B.E. Lessin, S.K. Irani, B.A. Lowen, B.A.M. Meyers, M. Mohamadi, A.S. Lai, E. Rodriguez, V.E. Hanes, A.G. Levy, L.E. March, M.A. Newman, RS. Waldman, L.A. Wisneski

Special Lecturers S. Katz, B.W. Janicki

Rios

303 **Computers in Clinical Cardiology** (5 or 7½)

Emphasis on development of computer programs applicable to clinical cardiology. Students given opportunity to develop original applications programs or to interact with staff in programming and validation of automated systems for the analysis of intracardiac electrocardiography, noninvasive cardiological techniques, exercise electrocardiography, etc. Prerequisite: basic knowledge of FORTRAN and personal interview. Limited to two students. 4- or 6-week elective periods. Univ. Hosp.

Staff

*305 **Inpatient Clerkship** (10)

Comprehensive study of patients; history and physical examination; ward rounds, consultations, conferences, preceptorial teaching, seminars. V.A. and Univ. Hosps., and Wash. Hosp. Center. (8-week periods throughout academic year)

Arling

332 **Acting Intern in Medicine** (5)

Student is assigned to a patient-care team by the Medical Chief Resident. Under supervision of ward resident and attending physician, the student

* Required for medical students.

assumes an intern's responsibility for completing initial patient evaluation data base, writing medical orders (which must be cosigned by an M.D.), coordinating patient's care, writing progress notes, and dictating the discharge summary. Average patient load is six, allowing student sufficient time to study patient problems as well as to attend medical service conferences. Since acting interns assume primary patient responsibility, they cannot leave their teams for vacations or internship interviews. Group matches with Med 333 and 334. Univ. Clinic.

333 **Acting Intern in Medicine** (5 or 10) Curtin

Under the supervision of the medical resident and attending physician, student works with a patient-care team on a medical ward, does initial evaluation and presents patient's problem at attending rounds and appropriate teaching conferences. Subspecialty consultations also review patient's problem with the student. 4- or 8-week elective periods. Wash. Hosp. Center.

334 **Acting Intern in Medicine** (5 or 10) Zimmerman

Students assigned to a patient-care team under direct supervision of a University resident on general medical wards. Problem Oriented Medical Record System used. Students complete initial patient evaluation data base and are responsible for patient management during hospitalization. They write all orders, which must be reviewed and cosigned by the resident, and are expected to present their patients at attending rounds and conferences. Close supervision and guidance by the team resident, attending physician, and subspecialty consultants. Interview required. 4- or 8-week elective periods. V.A. Hosp.

336 **Acting Intern in Intensive Care Medicine** (5 or 10) Curtin

Student works on intensive care unit. 4- or 8-week elective periods. Wash. Hosp. Center.

350 **Clinical Infectious Diseases** (5 or 15) Parker

Fundamental concepts in the diagnosis and treatment of bacterial, viral, fungal, and mycobacterial infections. Students take primary responsibility for consultations; familiarization with advantages and limitations of laboratory techniques used to diagnose and manage infectious disease problems. Review of consultations seen by students by resident and full-time faculty members. Introduction to hospital infection surveillance program. 4- or 12-week elective periods. V.A. Hosp.

351 **Clinical Infectious Diseases** (5) Tuazon

Clinically relevant aspects of microbiology and immunology; relevant aspects of patient history, physical and laboratory examinations. Students will learn to do infectious disease consultations and to use antibiotics intelligently. Minimum 4-week clinical rotation. Students electing a longer time period will assist with research project in infections in drug abusers, staphylococcal infections (especially endocarditis), clinical pharmacology of gentamicin or mechanisms of immunity in sickle cell anemia patients. Two students may elect the clinical rotation.

352 **Clinical Cardiology** (10) Hsu and Staff

Experience in office-patient care, in-patient care, CCU, and interpretation of electrocardiograms. Participation in hypertensive research clinic, and graphics and exercise laboratories. Observation in catheterization labratory. 8-week elective periods. Open to four seniors. Univ. Clinic.

353 **Clinical Cardiology** (10) — Manchester

Observation of and participation in the diagnosis and clinical management of cardiovascular disorders. Acquaintance with physical signs of heart disease. Exposure to noninvasive diagnostic procedures, echo-, phono-, apex-cardiography; interpretation of electrocardiograms and chest x-rays; ward rounds in intensive coronary care unit. 8-week elective periods.

358 **Clinical Cardiology** (5) — Bacos, Mendelson, Marsh, Oboler

Bedside evaluation is emphasized and correlated with special diagnostic studies, including stress testing, phono-cardiography, echo-cardiography, cardiac catheterization, angiography, etc. 4-week elective periods. Wash. Hosp. Center.

359 **Coronary Care Unit** (5) — Bacos, Mendelson, Marsh, Oboler

Participation in patient care. Students work closely with house staff and attending staff. Emphasis on diagnosis and treatment of coronary disease, complications of infarction, diagnosis and treatment of arrhythmias, and selection of patients for surgical intervention. 4-week elective periods. Wash. Hosp. Center.

360 **Clinical Cardiology** (5 or 10) — Fletcher*

Experience in clinical cardiovascular problems under supervision of cardiology staff. Emphasis on history, physical diagnosis, and noninvasive cardiovascular techniques. Role of cardiac catheterization explained and results in specific cases discussed. Electrocardiography covered as one of the tools used to approach the cardiovascular patient. Patient management is integral part of course. Teaching rounds and conferences. 4- or 8-week elective periods. V.A. Hosp.

363 **Cardiac and Medical Intensive Care** (5) — Saunders†

Students take call every third night with a resident/intern team. Participation in all aspects of coronary care and familiarization with special unit techniques such as cardioversion, pacemakers, Swanz-Ganz catheters, intra-aortic balloon counterpulsation and mechanical ventilators. Opportunity for supervised management of a spectrum of other critical illnesses. 4-week elective periods. V.A. Hosp. Open to one student per period. Those interested should contact the instructor.

364 **Cardiovascular Data Processing** (5 or 10) — Pipberger

Study of a variety of modern computer techniques; primary research in computer analysis of electrocardiograms. 4- or 8-week elective periods. V.A. Hosp.

365 **Clinical Electrocardiography and ECG Computer Analysis** (5 or 10) — Pipberger

Participation in daily computer processing and analysis of all electrocardiograms from seven V.A. hospitals and Children's Hospital, D.C. ECG findings correlated with clinical data from all problem cases. Daily review sessions with section chief and cardiac fellows. Participation in weekly seminars and a Journal Club. 4- or 8-week elective periods. V.A. Hosp.

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* Dr. Fletcher is Chief of Cardiology at the Veterans Administration Hospital.
† Dr. Saunders is Assistant Chief of Medicine for Intensive Care at the Veterans Administration Hospital.

371 **Endocrinology** (5) Gaskin

Student evaluates patients referred to the endocrinology service, takes part in planning diagnostic work-ups or therapy programs, and is responsible for case presentations. Techniques used in the endocrinology laboratory, such as protein binding determinations and radio-immuno assay of hormones; participation in Journal Club two mornings a week and in weekly conferences. The student is expected to assume prime responsibility for directing patient evaluations. 4-week elective periods. Wash. Hosp. Center.

373 **Endocrinology and Metabolism** (5, 10, or 15) Becker

Clinical experience in endocrinology and metabolism. Students examine endocrine patients, make preliminary diagnoses, and assist in treatment. Clinical rounds daily; weekly endocrine clinic, diabetic clinic, and Journal Club participation; laboratory and research experience available. 4- to 12-week elective periods. V.A. and Univ. Hosps.

375 **Endocrinology Research** (10) Becker and Staff

Participation in endocrinology and metabolism research laboratory. Introduction to chemical and technical aspects of endocrine research. Participation in ongoing research activities. Students learn appropriate procedures, such as radioimmunoassay of hormones, histopathologic technics, atomic absorption spectrophotometry, and investigative approach to solving research problems. Prior interview with instructor suggested. 8-week elective periods. V.A. Hosp.

376 **Metabolic Disorders in Diabetes** (5) Penhos

Intensive and practical studies of the technique to examine surgical, chemical, and hormonal diabetes. Participation in research on carbohydrate, protein, and lipid metabolism, insulin secretion in isolated organ perfusions. Seminars and participation in Journal Club; discussions on the results obtained. 4-week elective periods. V.A. Hosp.

381 **Research in Endocrinology** (5) Penhos

Participation in endocrine research, including laboratory experience, experimental surgery, biochemical methods, and *in vivo* and *in vitro* endocrine studies. Weekly seminars and discussions correlate experimental results with clinical observations. 4-week elective periods. V.A. Hosp.

385 **Biochemical Abnormalities in Disorders of Lipoprotein Metabolism** (15) LaRosa

Current research directed toward the biochemical purification of enzymes responsible for removing lipids from the plasma and a study of the possible relationship between induction of these enzymes and the progestional and estrogenic components of currently used birth control pills. Experience in the use of modern techniques of protein separation, including ultracentrifugation, electrophoresis, and chromatography; experience in handling radioactive isotopes. Clinical experience with patients who have hyperlipoproteinemia. 12-week elective periods. Nat'l Heart and Lung Institute, NIH, and Univ. Hosp.

387 **Diabetes Research Laboratory** (15) Recant*

Research oriented toward the patient with diabetes mellitus. Studies in humans, laboratory animals, isolated perfused organs, and isolated tissue

* Dr. Recant is Chief of the Diabetes Research Laboratory at the Veterans Administration Hospital.

in vitro. Diagnostic studies for hypoglycemia and hyperglycemia. Consultations and rounds on patients with problems in carbohydrate or lipid metabolism. Weekly conferences. 12-week elective periods. V.A. Hosp.

390 **Extramural Internal Medicine Elective** (arr.)

The department arranges for students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

391 **Clinical Oncology** (10 or 15) Cohen

Participation in clinical management of patients with carcinoma on the medical oncology ward. 8- or 12-week elective periods. V.A. Hosp.

393 **Medical Oncology** (10) Young

Current methods in evaluation and treatment of lymphomas, chronic leukemias, ovarian, breast, and other malignancies, including a view of the broad spectrum of these diseases. Participation in patient care and laboratory studies of current research in clinical pharmacology, tumor kinetics, and *in vitro* marrow culture techniques. Prerequisite: permission of instructor. 8-week elective periods. Nat'l Cancer Institute, NIH.

396 **Clinical Pharmacology** (5, 10, or 15) Wolff

Introduction to clinical pharmacology and toxicology as the basis of the regulatory work of the Food and Drug Administration. Collaboration with a team of scientists reviewing investigational new drug applications and new drug applications, with a drug experience reporting system, and with annual reviews of drugs in specific areas, emphasizing study of the benefit/risk ratio. Project work in a toxicology laboratory. Interview required. 4- to 12-week elective periods. Bureau of Drugs, FDA.

402 **Research in Cancer Immunology** (10) Hollinshead

Laboratory experience with tests used to correlate cellular anti-tumor reactivity to solid tumors with the clinical course of the disease; experiments to investigate viral etiology of certain forms of cancer; study of fetal antigens and role in oncogenesis; cell membrane antigens specific for leukemia. One senior; 8-week elective periods. Ross Hall.

412 **Clinical Gastroenterology** (5 or 10) Staff

Work in a suburban office devoted to private partnership practice of internal medicine with emphasis on gastroenterology. Hospital rounds, evaluation of problems, discussion with attending physician and patient of diagnosis and therapy, observation of and assistance in specialized procedures, practical aspects of office management. 4- or 8-week elective periods.

413 **Clinical Gastroenterology-Hepatology** (5 or 10) Dobbins, Ginsberg

Intensive clinical experience with patients who have digestive diseases, including those of the gastrointestinal tract, liver, and pancreas. Patient consultations, teaching rounds, seminars. Joint conferences with surgery, pathology, and radiology staffs emphasize multidisciplinary approach to digestive diseases. 4- or 8-week elective periods. Univ. Clinic.

414 **Clinical Gastroenterology-Hepatology** (5 or 10) Finkelstein

Students see patients referred to the gastroenterology-hepatology section for consultation and are responsible for initial evaluation and the follow-up of these patients. Participation in all specialized procedures, including

various biopsy techniques and endoscopies. Teaching rounds, conferences, seminars. Student may elect to concentrate in either gastroenterology or hepatology. 4- or 8-week elective periods. V.A. Hosp.

423 **Clinical Gastroenterology** (5) Trujillo

Introduction to clinical problems in diagnosis and treatment of gastroenterology in both office and hospital practice. Peritoneoscopy, endoscopy, and biopsies. 4-week elective periods. Univ. Hosp.

424 **Morphology of the Liver and Intestines** (10) Dobbins

Research designed to acquaint the student with a variety of morphologic techniques used in the study of mucosal disease of the gastrointestinal tract. Includes electron microscopy and light microscopy techniques—phase and fluorescent microscopy. Preference given to student able to continue on a part-time basis following completion of the elective. 8-week elective periods. Univ. Clinic.

426 **Research in Metabolism of Sulphur Amino Acids** (15) Finkelstein

Study of methionine metabolism in mammalian tissues using several research techniques: kinetic properties of purified enzymes; induction and repression of enzymes by hormones and diet; metabolism of methionine in the isolated perfused rat liver. Projects available in any of the above areas and will be developed further to meet student needs. 12-week elective periods. V.A. Hosp.

430 **Clinical Hematology** (5) Schechter* and Staff

Study of the methods for evaluation and treatment of patients with hematological disorders. Ward rounds, morphology review sessions, participation in hematology clinic and Journal Club. 4-week elective periods. V.A. Hosp.

431 **Clinical Hematology and Oncology** (5 or 10) Lessin and Staff

Participation in the diagnosis and therapy of hematologic and oncologic disorders, including in-patient and out-patient consultations, daily care, and follow-up of clinical hematologic problems. Emphasis on acquainting the student with modern hematologic diagnostic procedures and current literature. 4- or 8-week elective periods. Univ. Hosp. and Clinic.

432 **Clinical Hematology** (5) Pierce

Clinical evaluation of in-patients and out-patients with symptoms referrable to the myelopoietic system using bedside and laboratory investigative parameters. 4-week elective periods. Wash. Hosp. Center.

433 **Hematology** (5) Rheingold

Observation of and participation in diagnosis and treatment of patients with hematologic disorders. 4-week elective periods. Physician's office.

435 **Hematology Research** (10) Lessin and Staff

Participation in the hematology research laboratory. Emphasis on development of the student's own project related to dynamic morphology of the blood cells, blood cell ultrastructure, and electron microscopy techniques. Introduction to red cell rheology and physiology. 8-week elective periods. Univ. Hosp.

* Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.

436 **Hematology Research** (10 or 15) Schechter*

Lymphocyte and plasma cell biology, in particular blastogenesis and macrophage interactions. Facilities available to do *in vitro* production culture of human peripheral blood and bone marrow, radioisotopic studies, and electron microscopy. 8- or 12-week elective periods. V.A. Hosp.

437 **Blood Transfusion in Clinical Practice** (5) Greenwalt

Demonstration and discussion of the preparation, properties, and clinical use of all blood components and of the basic genetics and immunology of the blood groups and allotypes. Opportunity to perform bench work in resolving immunologic transfusion problems. 4-week elective periods.

440 **Pulmonary Medicine** (5 or 10) Staff

Introduction to the diagnosis and treatment of patients with lung diseases, including acute respiratory failure. Daily teaching rounds and supervised consultation on all patients, including those in pulmonary clinic and pulmonary function laboratory. 4- or 8-week elective periods. V.A. Hosp.

442 **Pulmonary Diseases** (5) Witorsch

Performance and interpretation of pulmonary function studies, including ventilatory, diffusing capacity, and blood gas analysis; daily teaching rounds and supervised consultation on patients with various pulmonary and infectious diseases. Participation in pulmonary clinic; techniques and principles of inhalation therapy. Principles of and experience with respiratory failure and respiratory intensive care. 4-week elective periods. Wash. Hosp. Center.

449 **Primary Care Elective** (5 or 10) Arling

Students assigned to European-trained family practitioner in small town on a Bahaman out-island. Caring for patients with medical, surgical, pediatric, obstetrical-gynecological, psychiatric, and tropical disease problems. Students responsible for their own transportation. Housing may be provided. 4- to 8-week rotations. Open to two students each period.

451 **Arthritis and Rheumatic Diseases** (5) Felts

Introduction to clinical problems in the diagnosis and treatment of arthritis and rheumatic diseases. Emphasis on patient evaluation and establishment of therapeutic priorities. 4-week elective periods. Univ. Clinic.

452 **Clinical Rheumatology** (5) Alepa†

Active participation in work-up and management of in-patients and clinic patients with rheumatic diseases. History, physical examination, differential diagnosis, immunological mechanism, x-ray reading, and use of laboratory tests are stressed. Laboratory facilities available with emphasis on immunology. 4-week elective periods. V.A. Hosp.

453 **Introduction to Arthritis** (5) Barth

Work-up, rounds, clinic, and consultations on patients with arthritis and rheumatic diseases. Daily discussions on selected topics in rheumatology, including clinical immunology, major disease categories (SLE, RA, gout,

* Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.
† Dr. Alepa is Chief of the Rheumatology Section at the Veterans Administration Hospital.

etc.), differential diagnosis, drug therapy, serological reactions, x-ray changes. 4-week elective periods. Wash. Hosp. Center.

454 **Total Patient Care** (5) Tamagna

Participation in total patient care program, including medical rehabilitation and group evaluation conferences. 4-week elective periods. Univ. Hosp.

455 **Physical Medicine and Rehabilitation** (5) Chiu, Mourad, Enders

Participation in all activities in in-patient and out-patient diagnosis, treatment, consultation, and EMG. 4-week elective periods. Univ. Hosp.

460 **Renal and Electrolyte Disorders** (5) Berkman

Participation in consultations on renal and electrolyte abnormalities; follow-up of patients. Examination of urinary sediment and exposure to peritoneal dialysis, hemodialysis, renal biopsy, and transplantation. Conferences, reading assignments, ward rounds, participation in Journal Club. 4-week elective periods. Wash. Hosp. Center.

461 **Clinical Renal Disease** (5) Parrish, N. Kramer, Guha, A. Thompson

Participation in clinical and laboratory procedures used in the study of renal disease. Ward rounds, consultations, conferences, seminars. 4-week elective periods. Univ. Hosp.

463 **Clinical Application of Tissue Immunology** (5) N. Kramer

Application of immunologic methods to the study of human hypersensitivity states and metabolic diseases; study of serum proteins, including protein hormones and enzymes; research principles and methods; tissue typing and flourescent antibody methods. 4-week elective periods. Univ. Hosp.

465 **Renal Diseases and Fluid and Electrolyte Problems** (5 or 10) Jacobson

Participation in office and hospital consultations; care of patients with renal diseases and fluid and electrolyte problems. Familiarization with a variety of renal problems; work-ups of patients with renal disease; evaluation of renal function studies. Emphasis on critical use of medical literature. One student. 4- or 8-week elective periods.

469 **Clinical Renal Disease** (5 or 10) Shalhoub*

Broad exposure to and active participation in all the clinical activities of the renal section, including consultations, hemodialysis, outpatient clinic, rounds, conferences, and Journal Club meetings. 4- or 8-week elective periods. Time period must first be cleared through instructor's office. V.A. Hosp.

470 **Allergy Clinic** (5) Ratcliffe, Werth

Lectures, conferences, and attendance at allergy clinic. Detailed history-taking, physical examination, and special skin-testing techniques, laboratory procedures. Discussion of each case with an allergist and development of complete management program. 4-week elective period. Univ. Clinic.

* Dr. Shalhoub is Chief of the Renal Section at the Veterans Administration Hospital.

471 **Allergy Clinic** (5) Ward, Evans
Same as Med 470. 4-week elective period. Walter Reed Hosp.

472 **Private Office Practice of Allergy** (5) Barr
4-week elective period.

473 **Extramural Allergy Elective** (arr.)
The department arranges for students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

474 **Private Office Practice of Allergy** (5) Seltzer
4-week elective period.

483 **Nuclear Medicine** (15) Sauerbrunn*
Introduction to radioisotope methodology as applied to diagnostic or therapeutic problems in medicine. Study of the unique properties of radioactivity, radiation safety, and instrumental uses in the detection of radiation. Evaluation of patients referred for diagnostic and therapeutic studies. Student may choose a selected field of interest for more intensive study and may engage in limited participation in on-going clinical research projects. 12-week elective periods. V.A. Hosp.

485 **Biochemical Endocrinology** (15) Staff
Student develops research project or participates in ongoing research project. Emphasis on experimental design and techniques used in solving modern medical problems. One senior (any time). Permission of instructor required. 12-week elective periods (September through May). NIH.

495 **Oncology Review** (5) Hollinshead
Each student is assigned a carefully selected reading list on one form of cancer. Fundamentals, basic research, and latest clinical approaches are discussed in detail. Each student will write and illustrate a review of his or her subject. Interested students are encouraged to undertake their own research project the following summer. 4-week elective period.

Microbiology

Chairman: L.F. Affronti

Professors M.L. Robbins, R. Hugh, E.M. Lerner II *(Research)*, L.F. Affronti
Professorial Lecturer D.H. Heilman *(Cellular Immunology)*
Associate Professors M. Reich, K. Huang, P.D. Kind, Y. Chu *(Research)*
Assistant Professors R.F. De Giovanni-Donnelly *(Research)*, M.R. Loeb *(Research)*

* Dr. Sauerbrunn is Chief of Nuclear Medicine at the Veterans Administration Hospital.

106 **Environmental Science of Nosocomial Infection** (1) **Staff**

Developing a surveillance protocol for nosocomial infection. Microbiological assay of the animate and inanimate components of the hospital environment. (Spring)

128 **Microbiology for New Health Practitioners** (2) **Staff**

Lecture course for students in allied health program. Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance.

151 **Public Health Microbiology I** (3) **Staff**

Medical parasitology, protozoology (intestinal), the Haemosporidia (malaria), the Haemoflagellates, and the metazoa (helminths) of medical importance. (Spring)

152 **Public Health Microbiology II** (2) **Staff**

Clinical bacteriology; characteristics and identification of the bacteria involved in disease; study of rickettsia and viruses. (Spring)

153 **Public Health Microbiology III** (2) **Staff**

Study and identification of the flora of water, dairy products, food, and the atmosphere. (Spring)

154 **Public Health Microbiology IV** (1) **Staff**

Mycology: study of medically important fungi, systematic mycoses, and dermatomycoses. (Spring)

*201 **Medical Microbiology** (8) **Staff**

For medical students; open to qualified graduate students with permission. Bacteria, rickettsiae, viruses, yeasts, molds, protozoa, metazoa, and immunological concepts which relate to the health and disease of humans —cultural studies, methods of diagnosis, theories. Laboratory fee for nonmedical students, $20. (Spring)

211 **Microbiology** (4) **Staff**

For graduate students. Bacteria viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22, or other biochemistry course, and permission of instructor. Laboratory fee, $20. (Fall)

212 **Pathogenic Bacteriology** (3) **Hugh**

(Formerly Pathogenic Microbiology [4])

Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial disease of man. Prerequisite: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 **Tissue Cell Culture and Somatic Variation** (4) **Staff**

Techniques of tissue culture and means of studying somatic variations. Prerequisite: Micr 211 or equivalent. (Spring)

215 **Medical Parasitology (2)** **Staff**

For graduate students; open to medical students. Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

* Required for medical students.

219 **Scientific Writing for Graduate Students** (1) Staff

Required of all graduate students prior to writing a thesis or dissertation. Some research experience required. (Academic year)

223 **Antimicrobial Chemotherapy** (1) Affronti, Reich

For medical students. Lecture course. Selection, clinical applications, and mechanism of action of various drugs and antibiotics used in the treatment of microbial infections. Members of the clinical faculty discuss relevant aspects of clinical chemotherapy. Prerequisite: Micr 201. (Fall)

225 **Microbial Physiology I** (3) Reich, Affronti

Morphology and biochemistry of various microorganisms with emphasis on bacteria. Prerequisite: Bioc 201 or 221–22; Micr 211 or equivalent. (Fall)

226 **Microbial Physiology II** (3) Reich, Affronti

Effects of physical and chemical agents on microorganisms with emphasis on antibiotics. Prerequisite: Micr 225 or permission of instructor. (Spring)

229 **Immunology** (3) Kind, Affronti

Lecture course. Fundamental immunologic concepts. Lectures will cover antigens, antibodies, antigen-antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor.

230 **Immunology Laboratory** (2) Kind, Affronti

Serologic and immunologic procedures as applied to clinical and research situations emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind

Lecture course. Study of immunological functions of reticulo-endothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Members of the clinical faculty discuss relevant aspects of immunobiology. For medical students, open to graduate students with permission of instructor.

233 **Virology** (3) Huang

(Formerly Biology of Viruses [2])

Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology—Laboratory** (2) Huang

(Formerly Biology of Viruses—Laboratory)

Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee for nonmedical students, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh

History of bacterial classification, international rules of nomenclature as applied to bacteria, development of bacterial classification based on relationships, survey of characteristics of bacterial groups. Prerequisite: Micr 201 or 212 or equivalent. (Fall, odd years) Staff

240–41 **Biomedical Instrumentation** (4–4)

(Formerly Micr 241–42)

Same as Bioc 225–26 and Phyl 223–24. Comprehensive study of theory

ical and practical application of biomedical instrumentation to the separation, identification, and quantification of materials of interest to biomedical and forensic scientists. Labratory fee, $50. (Academic year)

251 **Clinical Laboratory Bacteriology** (3) **Hugh**

For graduate students; open to medical students. Detection and identification of bacterial agents which cause diseases in humans. Comparative isolation and identification methods; emphasis on interpretation and significance of laboratory observations. Prerequisite: Micr 201 or equivalent. (Fall, even years)

252 **Medical Protozoology** (1) **Staff**

For medical students; open to graduate students. Lecture and laboratory course. Clinical recognition of important protozoal parasites in medicine. Disease, its pathology, symptomatology, diagnosis, treatment, and prevention. (Fall)

253 **Medical Helminthology** (1) **Staff**

For medical students; open to graduate students. Lecture and laboratory course. Clinical recognition of important parasitic worms in medicine. Disease, its pathology, symptomatology, diagnosis, treatment and prevention. (Fall)

254 **Malariology** (1) **Staff**

For medical students; open to graduate students. Lecture and laboratory course. Clinical, laboratory, and epidemiological factors in malarial diseases in humans. Pathogenesis, symptomatology, clinical, and laboratory diagnosis. (Fall)

255 **Clinical Virology** (1) **Huang**

(Formerly Virology)

Primarily elective course for medical students; open to graduate students. General principles of virology; emphasis on clinical situations. Prerequisite: Micr 201 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti

Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221–22 or equivalent, Micr 229. Laboratory fee for nonmedical students, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly

Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 **Cellular Immunology** (1) **Kind**

Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 **Seminar: Microbiology** (1–1) **Staff**

Required of graduate students. (Academic year)

280 **Virology** (10) **Huang, Robbins**

Selected problems, library assignments, laboratory studies. 8-week elective periods.

281 **Biological Basis of Infections** (5) Affronti, Reich
Selected problems, library assignments, laboratory studies, term paper. 4-week elective periods.

282 **Immunology** (5) Kind
Selected problems, library assignments, laboratory studies, term paper. 4-week elective periods.

283 **Bacteriology** (10) Hugh
Selected problems, library assignments, laboratory studies, term paper. 8-week elective periods.

289 **Inflammation, Immunity, and Hypersensitivity** (5) Affronti and Staff
4-week elective periods.

290 **Extramural Microbiology Elective** (arr.)
The department arranges for medical students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 **Research in Microbiology** (arr.) Staff
Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Neurological Surgery

Chairman: H.V. Rizzoli

Professors H.V. Rizzoli, T.H. Milhorat
Clinical Professors J.M. Williams, H.H. Ammerman, G. Di Chiro, G.J. Hayes, J.M. Van Buren, N.H. Horwitz, C.L. Li, A.K. Ommaya
Professorial Lecturer K.M. Earle
Associate Professors C.B. Early, D.R. Smith, G.J. Mathews
Associate Clinical Professors J.P. Murphy, A.N. Martins, A.P. Hustead

Assistant Professor A.I. Kobrine

Assistant Clinical Professors F.D. Cooney, J.W. Barrett, C.P.H. Carroll, E. Mannarino

Assistant Professorial Lecturer D.A. Ruge

Clinical Instructors R.A. Mendelsohn, J. Kushner, M.W. Dennis, M.K. Hammock, S. Koulouris, E.B. Byrd, K. Ghaemi, B. Stopak, J.R. Howe, E.C. Mills

302 **Clinical Clerkship in Neurosurgery** (2½) Staff

2-week elective periods. Univ. Hosp.

380 **Clinical Neurosurgery** (5) Staff

Clinical clerkship in neurosurgical service. Emphasis on neurologic examination; indications for special neurologic tests, e.g., arteriograms, pneumoencephalograms; and operative procedures. 4-week elective periods. Univ. Clinic.

381 **Clinical Neurosurgery** (5) Martins

Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. Emphasis on studies of cerebral circulation. 4-week elective periods. Walter Reed Gen. Hosp.

382 **Clinical Neurosurgery** (5) Early

Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. 4-week elective periods. Nat'l Naval Med. Center.

383 **Pediatric Neurosurgery** (5) Milhorat

Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. 4-week elective periods. Children's Hosp.



385 **Clinical Neurosurgery** (5)

Clinical clerkship includes experience with diagnostic procedures: arteriograms, pneumoencephalograms, myelograms, and assisting in operating room; conferences and ward rounds. 4-week elective periods. V.A. Hosp. Staff

387 **Clinical Neurosurgery** (5)

Participation in all departmental activities, including ward rounds, daily conferences, radiographic and pathologic studies, and operating room procedures. 4-week elective periods. Wash. Hosp. Center.

390 **Extramural Neurosurgery Elective** (arr.)

The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

Neurology

Chairman: G.F. Molinari
Director of Encephalographic Laboratory: A. Racy

Professors H. Stevens, S. O'Reilly, H.H. Hess, D.O. Davis, G.F. Molinari, S.A. Shelburne, Jr.

Clinical Professors W.K. Engel, D.S. Buchanan

Professorial Lecturer N.P. Goldstein

Associate Professor A.B. Barnet

Associate Clinical Professors A.S. Dekaban, A. Stazio, N. Myrianthopoulos, K.B. Nelson, K. Abraham, C. Ajmone-Marsan, A.J. Levens, D.J. Fishman

Assistant Professors M.M. Platt, A. Racy, V.J. Blazina

Assistant Clinical Professors V. Duggins, A.D. Huott, W.J. Hawes, M.M. Davis, W.E. Lightfoote II, F.H. Anderson, R.N. Edelson, M.C. Korengold, M. Osborn, D. Satinsky, H. Silby, E.C. Wilner

Clinical Instructor H.T. Vollero

380 **Clinical Neurology** (5) Molinari and Staff

Emphasis on neurologic examination; indications for special neurologic tests, e.g., arteriograms, pneumoencephalograms. 4-week elective periods Univ. Hosp.

382 **Pediatric Neurology** (5) Shelburne and Staff

Clinical clerkship in diagnostic study and care of in-patients and out-patients; conferences and teaching sessions. 4-week elective periods. Children's Hosp.

383 **Clinical Neurology** (5) Buchanan

Emphasis on neurological examination and basic sciences, including neuroanatomy, as applied to clinical material. 4-week elective periods. Walter Reed Gen. Hosp.

390 **Extramural Neurology Elective** (arr.)

Students electing clerkships at the University Hospital can spend another

elective period in another institution. They should arrange the elective with the other institution and bring a letter of acceptance to the chairman of the department of neurology for approval. The student is responsible for reporting the grade received to the department of neurology, which in turn will submit it to the Associate Dean for Curricular and Student Affairs.

Obstetrics and Gynecology

Chairman: A.B. Weingold

Professors R.H. Barter, J.G. Sites, S.E. Fabro, A.B. Weingold, R. Hertz *(Research)*, J.G. Maier, L. McGowan, R.A. Chez, J.D. Schulman, B. Waxman

Professorial Lecturers D.H. Kushner, J.B. Sheffery

Clinical Professors W.P. McKelway, M.P. Footer, W.H. Cooper, O.I. Dodek, Jr., H.L. Kotz, J.W. Pearson, Jr., H.A. Donald, N.J. Price, T.A. Wilson

Associate Professors J.B. Craft, Jr., S. Marinoff

Associate Clinical Professors W.T. Lady, S.S. Martin, D. Walters, J.M. Friedman, P. Soyster, J.C. Walsh, L.M. Liverett, M.S. Burnhill, S.M. Belinsky, E.A. Crisp, C.R.A. Gilbert, L. Goldstein, J. Grodin, M. Rosenbaum, A.A. Becker, R.J. Clark, C.B. Jacobson, J.J. Kuhn, L.Q. Pugsley, A.I. Robins, S.F. Stewart, Jr., N.M. Tart, E.W. Titus, Jr.

Assistant Professors J.C. Srabstein, R.J. Falk, J.L. Marlow, J.W. Larsen, Jr., J.D. Berryman, N.A. Carr, A.A. deMoya

Assistant Clinical Professors J.R. Epstein, S.H. Shea, H.P. Treichler, I.W. Rovner, M.W. Sandmeyer, Jr., G. Speck, A.W. Winshel, R.V. Erkenbeck, J. Fogel, S.F. Stewart, Jr., W.F. Peterson, G.R. Hewlett, C.E. Townsend, J.M. Close, S.D. Cooley, C.L. Campbell, L.E. Fettig, E.E. Gahres, R.S. Guy, D.H. Martin, G.W. Paul, L.C. Radice, M. Savarese, E.W. Titus, Jr., W.D. Wallace, V.B. Hugh, S.C. Booker, S.D. Copley, A.J. Heintze, M.A. Jerome, G.M. Kioko, E.G. Koch, S.T. Lee, S.H. Lipsius, J.H. Niles, M.J. Roberts, A.M.L. Van Rooy

Assistant Professorial Lecturers J.C. Bulger, A. Kramm

Instructors A. Razi, J.H. Grossman III

Clinical Instructors A.S. Bright, D.R. Carlson, E.E. Cunningham, J. Sacks, R.E. Badwey, T.H. Gresinger, E.R. Kovereid, D.M. Margulies, J.C. Skilling, R.W. Smith, R.M. Regan, B.A. Band, W.R. Perkins, J.E. Anderson, D.C. Meek, C.D. Lord, H.C. Beaver, D. Davoudlarian, M. Fialco, R.J. Pierce, C.I. Schneiderman, J.E. Alarcon, A.A. Greenfield, T.A. Cook, Jr., R.C. Rigor, S. Shinde, F.A. Akerele, J.W. Lyles, J. Pan, K. Bis, S.P. Gardner, J. Izanec, S.R. Johnson, A.M. Lazarus, R.S. Margolis, C.A. Olds, R.J. Orleans, D.S. Chuzi, V.L. Crandall, F. Akbar, B.J.L. Chiota, D.C. Cinnamon, W.D. Cooper, V.B. Ford *(Nurse Midwifery)*, I. Kogan

Special Lecturers L. Burnhill, R.T. Greenfield, J.L. Sever

*303 **Clinical Obstetrics and Gynecology** (10) Staff

Participation in all obstetrical and gynecological clinics, daily departmental conferences and ward rounds at University, Fairfax, and Columbia Hospitals. Manikin demonstrations of mechanism of labor and various types of operative delivery. (8-week periods throughout academic year)

375 **Clinical Obstetrics and Gynecology and Family Planning** (5) Weingold, Waxman, McGowan

Participation in office practice of obstetrics and gynecology and family planning clinic. 4-week elective periods. Univ. Clinic.

376 **Gynecologic Oncology and Cytopathology** (5) McGowan

Participation in all aspects of clinical in-patient and office diagnosis and treatment of women with gynecologic cancer. Related research. 4-week elective periods. Univ. Clinic.

377 **Fetal Monitoring in Labor** (5) Waxman

Application of fetal monitoring; accumulation and interpretation of data. Participation in intra-partum study of effects on the fetus of labor position, medication, and types of delivery. 4-week elective periods. Univ. Clinic.

378 **Endocrinology, Clinical and Laboratory Applications** (5) Falk

Clinical and laboratory approach to infertility and gynecological endocrinology. 4-week elective periods. Columbia Hosp.

380 **Clinical Obstetrics and Gynecology** (5) Gahres, Radice

Participation in patient care, clinics, surgery, and delivery. 4-week elective periods. Alexandria Hosp.

383 **Clinical Obstetrics and Gynecology** (5) Footer, Friedman

Participation in office practice of obstetrics and gynecology. 4-week elective periods.

385 **Clinical Gynecology** (5) Gahres

Case assignments, rounds, and conferences, including tumor board, gynecologic pathology, preparation for surgery, attendance at surgery, post-operative care. 4-week elective periods. Wash. Hosp. Center.

387 **Inpatient Obstetrics and Gynecology** (5) Patow†

Supervised obstetrics and gynecology in a larger military hospital; rounds and conferences. 4-week elective periods. Walter Reed Gen. Hosp.

389 **Clinical Obstetrics and Gynecology** (5) Fabro

Participation in patient care, rounds, and conferences. 4-week elective periods. Columbia Hosp.

390 **Extramural Obstetrics and Gynecology Elective** (arr.)

The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

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* Required for medical students.
† Dr. Patow is Chief of the Obstetrics and Gynecology Service at Walter Reed General Hospital.

Ophthalmology

Chairman: M.F. Armaly

Professor M.F. Armaly

Clinical Professors M.M. Parks, M.G. Alper, L.E. Zimmerman

Associate Professors B.S. Fine *(Research)*, M.O. T'so *(Research)*, D.S. Friendly, L.H. Seaton II

Associate Clinical Professor L.M. King, Jr.

Assistant Professors R.N. Sunga, H.S. Zakharia, M.D. Olson, M.J. McCrea *(Research)*, B.A. Drum *(Research)*, P.M. Holland

Assistant Clinical Professors W.J. Romejko, W.P. Chalfant, Jr., R.E. duPrey, R. Day, J.H. Lodge, W.B. Glew, K.A. Simon, H.A. Urweider, B.H. Zeavin, H.N. Bernstein, D.K. Berler, J.N. Goldman, A.L. Fjordbotten, W.S. Gilbert, H.S. Wicker, D.G. Albert, S.P. Ginsberg, M.H. Zimmerman, F.G. La Piana, F. Reeser, G.D. Rogell, J.F. O'Neill, D.E. Schwartz, P.T. Gavaris, S.S. Pappas

Instructor T. Frey

Clinical Instructors R.S. Deitch, H.I. Rodman, G. Liss, H.M. McAllister, L.E. Perraut, H.J. Starr, L. Kogan, J.F. Nowell, B. Ehrlich, D.L. Lanter, R. Huberman, P.A. Dorn, Jr., E.M. Zimmerman, J. Snyder, B.S. Bruner, M.E. Lederman, L.E. Rothkoff, M.D. Krinn, D.M. Wanicur, W.S.N. Ibrahim, E.M. Titer, D.T. Casey, S. Stoleru, A.E. Eager, B.G. Brown III

281 **Ophthalmic Pathology I** (1) L. Zimmerman

Basic science aspects of diseases of the eye. (Spring)

282 **Ophthalmic Pathology II** (3) L. Zimmerman

Diseases of the eye as revealed by gross and microscopic examination. Open to eight students. Armed Forces Inst. of Path. (Spring)

284 **Ophthalmic Pathology III** (5) L. Zimmerman

Daily participation in an active service limited to pathology of the eye and its adnexa. Inflammatory, degenerative, and neoplastic diseases. 4-week elective periods. Armed Forces Inst. of Path.

380 **Clinical Ophthalmology** (5) Lodge

Observation and participation in examination, diagnosis, and management of wide variety of ocular conditions. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases and emergencies. Lectures, rounds, and seminars. Open to one senior. 4-week elective periods. Wash. Hosp. Center.

381 **Clinical Ophthalmology** (2½ or 5) Armaly and Staff

Observation and participation in examination, diagnosis, and management of wide variety of ocular conditions in ambulatory patients. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. Open to two seniors. 2- or 4-week elective periods. Burns Bldg.

382 **Clinical Ophthalmology** (2½ or 5) Seaton

Observation and participation in examination, diagnosis, and management

of wide variety of ocular conditions. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. Open to two seniors. 2- or 4-week elective periods. Nat'l Naval Med. Center.

390 **Extramural Ophthalmology Elective** (arr.)

Special elective program arranged for selected students at other institutions. Interested students should contact the chairman of the department.

Orthopaedic Surgery

Acting Chairman: H.L. Feffer

Professors J.P. Adams, H.L. Feffer, F. Leonard *(Research)*, D.W. McKay, R.S. Snell, P.I. Kenmore, R.J. Neviaser

Clinical Professors J.S. Neviaser, L.T. Peterson, C. Keck

Associate Professors W.P. Fortune, B.K. Slemmons, S.F. Gunther

Adjunct Associate Professor G.P. Bogumill

Associate Clinical Professors R.L. Dow, B. Genner III

Assistant Professors H.O. Goller *(Research)*, S.S. Nason, D.B. Parsons *(Research)*, D. Lichtman, R.J. Lewis, R.J. Starkweather

Assistant Clinical Professors G.J. Schonholtz, G.I. Baker, S.H. Eisenberg, K.A. Peterson, L.A. Ottenritter, H.S. Cattell, B.P. Vitek, C.W. McCutchen *(Biomechanics)*, A.I. Dobranski, S. Lavine, M.A. Schultz, U.M. Fortune, S.S. Haas, T.J. Radley, P.A. Moskovitz

Adjunct Instructor W.J. Sadlack

Clinical Instructors R. Ottenberg, R. Conant, J.W. Harvey, R.M. Ackerman, R.J. Heilen, C.C. Liu, F.R.T. Nelson, T.J. Neviaser, R.L. Gaertner, R. Loeffler, C.C. MacCartee, Jr., J.F. Witte, H.N. Mininberg, J.E. Grasinger

*302 **Clinical Clerkship in Orthopaedic Surgery** (2½)

Two weeks at the Univ. Hosp. or at the Wash. Hosp. Center. (Assignment to be made by the Department.)

380 **Orthopaedic Surgery** (5) Feffer and Staff

Rotating program: one week of adult orthopaedics at University Hospital; one week of children's orthopaedics at Children's Hospital; one week of general orthopaedics at Walter Reed General Hospital, Andrews Air Force Base Hospital, or National Naval Medical Center. 4-week elective periods.

382 **Orthopaedic Surgery** (5) Kenmore

Participation in total care program of orthopaedic patients: daily rounds, conferences, seminars. 4-week elective periods. V.A. Hosp.

* Required for medical students. Credit is part of and is assigned after completion of Surg 300.

383 **Sports Medicine** (2½ or 5) **Haas**

Introduction to athletic injuries, including prevention and management. Interested students should contact Dr. Haas. 2- or 4-week elective periods.

390 **Extramural Orthopaedic Surgery** (arr.)

The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

395 **Research in Orthopaedic Surgery** (arr.) **Leonard**

4-, 8-, 12-, or 16-week elective periods. Univ. Hosp.

Otolaryngology

Chairman: J.J. McFarland, Jr.

Clinical Professor W.M. Trible

Associate Clinical Professors J.J. McFarland, Jr., M. Fischer, D.N.F. Fairbanks, R.E. Pumphrey, Jr., B.M. Webb, M.E. Krucoff, R.S. Page, Jr., J.A. Sabri

Assistant Clinical Professors J.L. Levine, S. Epstein, B.A. Feldman, I.S. Jaffee

Clinical Instructors H.H.E. Scheidemandel, G.F. Miller, Jr., R.J. Bobys, D. Isaacson, H.C. Stein, N.L. Barr, Jr., B. Modlin, A. Small

380 **Otolaryngology** (5 or 15) **McFarland**

Care of in-patients and out-patients. Diagnosis, therapy, rounds, and conferences. 4- or 12-week elective periods. Wash. Hosp. Center.

390 **Extramural Otolaryngology Elective** (arr.)

The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

395 **Clinical Clerkship** (5) **Staff**

In-paitent and out-patient rotations; operating room experience. 4-week elective periods. Nat'l Naval Med. Center.

Pathology

Chairman: H. Sidransky

Professors F.N. Miller, Jr., W. Newman, B.H. Smith, M.J. Matthews, M. Werner (*Laboratory Medicine*), A. Breslow, L.S. Lessin, S. Bloom, C.J. Stahl III, H. Sidransky

Clinical Professors L.E. Zimmerman *(Ophthalmic)*, E.B. Helwig *(Dermatologic)*, N.S. Irey, C. Hoch-Ligeti, J.L. Luke *(Forensic)*, R.S. Melville *(Laboratory Medicine)*, R.E. Palmer, H.W. Casey *(Comparative)*, C.B. Cook, C.F. Bishop, *(Radiation Therapy)*, W.J. Jaffurs, R.A. Malmgren *(Cytology)*, H.A. Schwamm

Professorial Lecturers P.D. Olch *(History of Medicine)*, T. Antonovych, W.C. Roberts *(Cardiology)*

Associate Professors W.L. Marsh, F.S. Jannotta, R.B. Lingeman, N. Saini, D.S. O'Leary *(Laboratory Medicine)*, S.G. Kent, B.C. Zook *(Comparative)*, Y. Al-Doory *(Laboratory Medicine)*, F.P. Abramson, L. Ortega, J.M.B. Hicks, R.S. Chandra, C.T. Garrett

Associate Clinical Professors V.E. Martens, A.D. Cramer *(Blood Banking)*, F.B. Johnson, H.J. Norris, G.H. Guin, G.G. Brennan, W.F. Enos, D.R. Parkinson, A.S. Lineberger, B.D. Blackbourne *(Forensic)*, I.D. Godwin, J.W. Howell *(Clinical Chemistry)*, H.R. Schumacher

Assistant Professors S.D.S. Hammersberg *(Medical Technology)*, J.G. Guccion, P.J. Robinson *(Microbiology)*, J.A. Zeller *(Laboratory Medicine)*, Y.C. Oertel, R.H. Patterson, S.P. Kapur

Assistant Clinical Professors M.J. Williams, M.B. Furlong, Jr. *(Laboratory Medicine)*, H.H. Berman, L. Riddick *(Forensic)*, K.B. Barr *(Laboratory Medicine)*, J.W. Manhart *(Allied Health Science)*, L. Hefter, R. Montali *(Comparative)*, J.H. Roe, Jr., P. Snow, M. Bayley *(Laboratory Medicine)*, R.D Bradley, T.E. Gran, J.L. Higgins *(Laboratory Medicine)*, M.T. Jessee, C.R Lissner *(Clinical Microbiology)*, W.P. Monaghan, C.M. Myers, L.L. Pitts II M. Prodanovich *(Clinical Chemistry)*, L.R. Rubel, S.W. Theune, F.M. Walsh C. Wang

Instructor K.H. Fischer *(Allied Health Science)*

Adjunct Instructors T.R. Callihan, C.S. Heffess, K. Rastgar, U. Thorgeirsson

Clinical Instructors A.B. Adcook *(Laboratory Medicine)*, C.L. Czerwinski *(Laboratory Medicine)*, H.I. Doerr *(Laboratory Medicine)*, C.R. Martin *(Laboratory Medicine)*, D.G. Martin *(Laboratory Medicine)*, M.F. Pratt *(Laboratory Medicine)*, C.M. Roock *(Laboratory Medicine)*, H.T. Trettel *(Laboratory Medicine)*, J.R. Crabbe, M. Helm, G.W. Jones, J.A. Maples, D.C. Nitschs L.F.B. Potempa, M.L. Pratt *(Blood Banking)*, M. Serre, R.E. Struempler, L.F Turner

Special Lecturers L.C. Johnson, D.E. Blessing, J.H. Rollen, R.C. Schoening, R.C.E. Scott, B.R. Hinton, J.C. LaPorte, G.L. Roecker, K.M. Doetsch, V.O Strubeck, Jr., J.A. Rosario, N.C. Brogdan *(Allied Health Science)*, K.R. Kahr J.D. Myers, D.R. Hunt, Jr., J.F. Schaumleffel, J.L. Shirey, R.M. Anglin, A.W Davison, M.J. Diaz, B.J. Green, K.E. Kauffman, H.A. Painter, M.A. Pask N.P. Risseeuw, D.D. Sullivan, R.R. Therrien

Courses numbered 13 through 20 are limited to military personnel in the Medical Laboratory Technique Program.

13 **Hematology** (6)

Basic hematologic procedures, diagnosis of abnormalities of cellular elements of blood and bone marrow, studies in blood coagulation, quality control in clinical hematology.

14 **Blood Banking** (6) **Staff**
Principles of immunohematology, blood donor center techniques, blood processing techniques, quality control in blood banking.

15 **Clinical Laboratory Rotation** (12) **Staff**
Instructions in laboratory technique, stressing the application of theories and principles of clinical chemistry, clinical microbiology, hematology, and blood banking in the day-to-day operations of the modern clinical laboratory.

16 **Clinical Chemistry** (5) **Staff**
Principles and techniques of blood chemistry analyses, including toxicological analyses for drugs of abuse and environmental poisons.

17 **Urinalysis** (2) **Staff**
Principles and techniques of urine chemistry and microscopic analysis.

18 **Bacteriology** (6) **Staff**
Identification of pathogenic micro-organisms by morphologic and cultural techniques.

19 **Parasitology** (4) **Staff**
Identification of human parasites and their life cycles; concentration methods, staining techniques and media for culture.

20 **Serology** (2) **Staff**
Principles and techniques of antigen-antibody reaction and immunological responses.

Courses numbered 100 through 114 are limited to off-campus military personnel in the Medical Technology Program.

100 **Clinical Chemistry Lecture** (4) **Staff**
Principles and techniques of clinical chemistry, instrumentation, and quality control.

102 **Clinical Chemistry Laboratory** (4) **Staff**

104 **Clinical Microbiology Lecture** (4) **Staff**
Principles and techniques of clinical bacteriology, parasitology, and serology.

106 **Clinical Microbiology Laboratory** (4) **Staff**

108 **Blood Bank Lecture** (4) **Staff**
Principles and techniques of donor processing, transfusion, and immunohematology.

110 **Blood Bank Laboratory** (3) **Staff**

112 **Hematology Lecture** (4) **Staff**
Principles and techniques of general hematology and coagulation.

114 **Hematology Laboratory** (3) **Staff**

Courses numbered 121 through 128 are open only to students enrolled in the Bachelor of Science degree program with a major in medical technology.

121 **Introduction to Medical Technology** (4) Staff
Eight-week orientation in laboratory medicine. (Fall)

122 **Clinical Chemistry Lecture** (3) Hammersberg and Staff
Ten-week lecture series on routine and special clinical chemistry techniques. (Spring)

123 **Clinical Microbiology Lecture** (2) Fischer and Staff
Six-week lecture series on bacteriology, mycology, and virology. (Fall)

124 **Blood Bank Lecture** (1) Marsh and Staff
Three-week lecture series on immunohematology and transfusion service. (Spring)

125 **Clinical Hematology Lecture** (2) Hammersberg and Staff
Six-week lecture series on routine and special hemotology and coagulation. (Fall)

126 **Selected Topics in Laboratory Medicine** (2) Fischer and Staff
Three-week lecture and laboratory series on clinical parasitology. Miscellaneous topics in fluid analysis. (Spring)

127 **Clinical Laboratory Rotation** (7) Staff
Sixteen-week rotation in the University Hospital laboratories. (Fall)

128 **Clinical Laboratory Rotation** (9) Staff
Twenty-five-week rotation in University Hospital clinical laboratories. (Spring)

129 **Pathology for New Health Practitioners** (3) Staff
Lecture course with optional laboratory. Basic pathologic concepts and infectious diseases; languages of pathology; fundamental disease processes. Emphasis on pathogenesis and dynamics of disease. Causation, evolution, and morphology of pathologic changes in the principal diseases of each organ system presented in coordination with clinical lectures in Idis 301. (Fall and spring)

152 **Introduction to Basic Laboratory Medicine** (3) Hammersberg
(Formerly HCS 152)
Theory, performance, and interpretation of some important routine clinical laboratory tests performed in a physician's office, such as complete blood counts with differentials, staining and reading smears, urinalysis and urine cultures, routine chemistries (sugar, BUN, electrolytes), microbiological culture and staining techniques, and organism identification. Lectures, demonstrations, audiovisuals. Supervised and evaluated performance of these tests in a laboratory setting. Prerequisite: Path 129. (Summer)

*201 **Pathology** (8) Staff
A year course; required for second-year medical students. General introduction to concepts of disease. Pathology of organ systems; correlative

* An interdepartmental course offered by the Departments of Pathology and Biological Sciences.

with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies.

203–4 **Pathology** (4–4) Staff

For graduate students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 204: Path 203. (Academic year)

*205 **Comparative Pathology I** (3) Zook

Study of disease in vertebrates, comparison with disease in humans. Mechanisms by which various agents provoke illness; body defensive reactions. Illustration of common diseases of various species, including material from captive wild animals. Recommended prerequisite: courses in anatomy, histology, and physiology. (Fall)

*210 **Comparative Pathology Laboratory** (2) Zook

Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to four students. Path. Lab., Nat'l Zoological Park. (Fall)

*215 **Perinatal Pathology Laboratory** (2) Kent

Special assignments for dissection and study. Univ. Hosp. (Fall—6 hours a week)

217 **Gross Autopsy Pathology** (1) Blackbourne, Miller

Review of current necropsy cases. Interpretation of clinical symptoms and signs and radiographs on the basis of gross changes in organs. Univ. Hosp. (Spring)

220 **Medical Mycology** (2 or 4) Al-Doory

Study of pathogenic fungi, mycotic diseases, and their clinical aspects. Emphasis on handling specimens, diagnosis, and identification of etiologic agents. (Fall)

252 **Forensic Pathology and Medical Jurisprudence** (1) Blackbourne, Riddick, Miller

Somatic death, coroner and medical examiner systems, pathology of physical and chemical injuries, medical licensure; the physician-patient relationship and professional liability are discussed. (Spring)

253 **Medicine in Shakespeare** (1) Miller

Seminars with student and staff presentations covering the medically significant plays of William Shakespeare. (Spring)

254 **Medicine in Literature** (1) Miller

Series of discussions with student and staff presentations covering novels, drama, nonfiction, and poetry of medical significance. (Fall)

260 **Obstetric and Gynecologic Pathology** (1) Jaffurs

Organ changes in normal and abnormal pregnancy, including both the mother and the fetus. Diseases of female genital system. (Spring)

* Open to limited number of graduate students, with permission.

261 **Seminar in Experimental Pathology** (1) Sidransky
Current topics in research in experimental pathology. (Spring)

266 **Comparative Pathology Elective** (1) Zook
(Formerly Comparative Pathology II)
Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to four students. Path. Lab., Nat'l Zoological Park. (Spring)

272–73 **Seminars in Mycology** (1–1) Al-Doory
Conferences and discussions on current topics and latest developments in medical mycology. Open to graduate students and residents. May be repeated for credit. (Academic year)

275 **Research in Mycology** (2 to 4) Al-Doory
Participation in experimental studies in mycotic diseases. Research in laboratory or community medicine related to mycology. May be repeated for credit. (Fall or spring)

*277 **Anatomic Pathology Clerkship I** (arr.) Staff
Gross human anatomy and pathology. Students spend up to 24 full-time weeks on the necropsy and surgical pathology services, receiving one semester hour of credit for each four-week period. Prerequisite: Anat 201 or equivalent. Univ. and V.A. Hosps.

279 **Ophthalmic Pathology I** (2) Zimmerman
Basic science aspects of diseases of the eye. (Spring—2 hours a week)

280 **Surgical Pathology I** (2) Newman, Palmer, Schwamm
(Formerly four credits)
Surgical pathology service at participating hospitals. Examining specimens from current surgical cases, correlating with clinical manifestations. Univ. Alexandria, and Andrews AFB Hosps. (Spring—3 hours a week)

*281 **Anatomic Pathology Clerkship II** (arr.) Staff
Gross and microscopic human pathology. Students spend up to 24 full-time weeks, or the equivalent part-time, on the necropsy and surgical pathology services, receiving one semester hour of credit for each four-week full-time period. Prerequisite: Path 201 or equivalent. Univ. and V.A. Hosps. (Spring)

282 **Ophthalmic Pathology II** (2) Zimmerman
Diseases of the eye as revealed by gross and microscopic examination. Concurrent registration for Path 279 required. Six students. Armed Forces Inst. of Path. (Spring—3 hours a week)

*283 **Anatomic Pathology Clerkship III** (arr.) Staff
Necropsy and surgical pathology service. Graduate students receive five semester hours of credit for each four-week period and may receive up to 30 semester hours of credit for six months full time. Medical students receive five semester hours of credit for each four-week elective period. Prerequisite: Path 201 or 203–4. (Medical students: 4- or 8-week elective periods. Graduate students: fall or spring)

* Open to limited number of graduate students, with permission.

284 **Ophthalmic Pathology III** (5) Zimmerman

Daily participation in service limited to pathology of the eye and its adnexa. 4-week elective periods. Armed Forces Inst. of Path.

285 **Clinical Pathology** (5) Martens

Selected techniques of clinical chemistry, hematology, bacteriology. Student selects laboratory problem. 4-week elective periods. Wash. Hosp. Center.

286 **Perinatal Pathology** (5) Kent

Participation in perinatal (fetal and newborn) necropsies. Study of selected teaching cases. Examination of selected placentas for disease. 4-week elective periods. Univ. Hosp.

287 **Immunohematology and Blood Banking** (5) Marsh

Preparation and use of blood and blood products in surgery and in blood diseases studied from laboratory and clinical viewpoints. Emphasis on management of acute clinical situations. 4-week elective periods. Univ. Hosp.

288 **Clinical Pharmacology and Toxicology** (5) Abramson

Correlations of therapeutic drug levels in hospitalized patients and out-patients with their clinical status. Evaluation of rational dosage schedules. Development and application of clinical laboratory methods for determination of drug levels. 4-week elective periods.

289 **Clinical and Anatomical Pathology** (5) Cook

Daily studies of surgical and necropsy pathology, including forensic pathology; clinical pathology projects, including hematology, isotopology, bacteriology. 4-week elective periods. Fairfax Hosp.

290 **Extramural Pathology Elective** (arr.)

The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

291 **Clinical and Anatomical Pathology** (5) B. Smith

Opportunity to explore in depth a topic selected from the field of pathology; library study. 4-week elective periods. V.A. Hosp.

293 **Clinical and Anatomical Pathology** (5) Palmer

Participation in departmental activities, including clinical chemistry, blood bank, microbiology, and hematology; surgical pathology; autopsy pathology, including medico-legal autopsies. 4-week elective periods. Alexandria Hosp.

294 **Forensic Pathology** (5) Luke

Participation in the activities of the office of the chief medical examiner of the District of Columbia: observation of scene investigation, participation in medico-legal autopsies, attendance at court trials, etc. 4-week elective periods.

*295 **Comparative Pathology II** (arr.) Zook, Casey, Montali

(Formerly Comparative Pathology III)

Participation in veterinary pathology service, including wild and domestic

* Open to limited number of graduate students, with permission.

animals. Graduate students receive five semester hours of credit for each four-week period and may receive up to 30 semester hours of credit for six months full time. Medical students receive five semester hours of credit for each four-week elective period. Prerequisite: Path 201 or 203–4, and 283. (Medical students: 4-week elective periods. Path. Lab., Nat'l Zoological Park, and Armed Forces Inst. of Path. Graduate students: fall or spring)

296 **Surgical Pathology II** (5) Newman

Evaluation of surgical specimens and correlation with clinical status of patient; description of gross and microscopic findings on assigned cases. 4-week elective periods. Univ. Hosp.

297 **Dermal Pathology** (5) Helwig

Microscopic conferences, review of current material and study sets. 4-week elective periods. Armed Forces Inst. of Path.

298 **Necropsy Pathology** (5) Staff

Organ changes in disease, gross and microscopic examinations, preparation of protocols. 4-week elective periods. Univ. Hosp.

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Pharmacology

Chairman: H.G. Mandel

Professors H.G. Mandel, V.H. Cohn, Jr., P. Mazel, R. Hertz *(Research)*, S.E. Fabro *(Research)*, J.A. Straw, I. Nakayama *(Visiting)*

Professorial Lecturers F.E. Hahn, J. Axelrod, E. Costa, R. Fischer

Associate Professors P. Klubes, F.P. Abramson

Assistant Professors G.S. Edwards, H.C. Harder, M. Shahvari *(Research)*, A.M. Suria, R.J. Anderson

21–22 **Chemistry and Physics of Anesthesia** (3–3) Mazel and Staff

For students in nursing anesthesia. Fundamental concepts of physics: general chemistry, organic chemistry, biochemistry, and their application to medicine and anesthesiology, including chemistry of respiration, acid-base balance, clinical biochemistry and enzymology, hormones, radioisotopes, electronics, physiochemical properties of anesthetic agents, and other related topics. (Academic year)

110–11 **Pharmacological Basis of Anesthesia** (4–4) Mazel and Staff

For students in nursing anesthesia. Fundamental principles of pharmacology; drugs affecting the autonomic nervous system, central nervous system, and cardiovascular system; fundamentals of inhalation anesthesia; auxiliary drugs used in anesthesiology; endocrines, cancer chemotherapy; other topics. (Academic year)

114 **Drugs and the Consumer** (3) Cohn and Staff

General concepts concerning drug action in the body. Mechanism of action of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hayfever, headache and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisite required. Limited enrollment. (Fall)

115 **Drug Abuse Education** (3) Cohn and Staff

Psychological and sociological bases of drug abuse, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to drug abuse. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. (Spring)

120 **Readings in Pharmacology for Anesthesia** (arr.) Mazel and Staff

For students in nursing anesthesia. Assigned reading in anesthesia and related areas; preparation of reports.

130 **Seminar: Accessory Drugs in Anesthesia** (2) Mazel and Staff

For students in nursing anesthesia. Presentation of the pharmacology and pharmacodynamics of accessory anesthetic drugs; emphasis on those areas not covered in Phar 110–11.

158 **Pharmacology for New Health Practitioners** (2) Klubes and Staff

For students in allied health programs. Basic pharmacology course. Drug preparations, the basis of their therapeutic and toxic actions and their fate in the body. Prerequisite: HCS 110, 112, Phyl 111.

191 **Respiratory Care** (3) Mazel and Staff

Same as Anes 191. For students in nursing anesthesia. Advanced techniques for care of patients requiring total respiratory support.

195 **Electronics for Medical Personnel** (2) Mazel and Staff

Same as Anes 195. For students in nursing anesthesia. Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care unit. Signal conditioning, processing and display techniques, special purpose instruments, safety hazards.

201 **Pharmacology** (8) Straw and Staff

A year course; required for second-year medical students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational therapy of disease. Prerequisite: Bioc 201, Phyl 201.

203 **Fundamental Principles of Pharmacology** (3) Cohn and Staff
(Formerly two credits)
Basic principles of pharmacology, including drug-receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms, drug toxicity. Admission by permission of instructor. (Fall)

205–6 **Pharmacology** (arr.) Cohn and Staff
For graduate students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational therapy of disease. Pharmacodynamics, mechanisms of action, physiological disposition, toxicity, and relative evaluation of drugs. Prerequisite to Phar 205: Bioc 221–22, Phar 203, Phyl 201, or approval of department. Prerequisite to Phar 206: Phar 205. (Fall)

215 **Adolescent Drug Abuse** (3) Cohn and Staff
Not open to medical students. Offered off campus through the College of General Studies. Primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, marijuana, hallucinogenic and psychedelic drugs, psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Mazel and Staff
For medical and graduate students. Recent advances and fields of research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

256 **Molecular Pharmacology** (2 or 3) Hahn
For medical and graduate students. Current theory on action of drugs, especially chemotherapeutic agents, at molecular level. Effect of drugs on biosynthetic processes of the cell with respect to DNA, messenger RNA, transfer RNA, ribosomes, protein, cell wall, and intermediary metabolites. Factors which alter action of drugs, such as drug interactions and resistance. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff
For medical and graduate students. Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

260 **Endocrine Pharmacology** (1) Hertz and Staff
For medical and graduate students. Lectures and seminars on recent advances in the pharmacology and mechanism of action of various hormones. (Spring, odd years)

267 **Pharmacological Research** (3) Staff
For graduate students. Research with staff members. May be repeated once for credit toward a Master of Science degree. (Fall and spring)

269 **Pharmacology Seminar** (1) Mazel and Staff
For graduate students. Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

272 **Physiological Disposition of Drugs** (3) Cohn

For graduate students. Fate of drugs in biological tissue. Absorption, distribution, chemical alteration, excretion of drugs; physical, chemical, and biological factors affecting these processes. Prerequisite: Phar 201 or 205–6 or permission of instructor. (Spring, even years)

275–76 **Advanced Topics in Pharmacology I–II** (1–1) Edwards and Staff

Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Academic year 1977–78 and alternate years)

277–78 **Advanced Topics in Pharmacology III–IV** (1–1) Edwards and Staff

Continuation of Phar 275–76. (Academic year 1978–79 and alternate years)

279 **Special Topics in Pharmacology** (arr.) Staff

Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Suria and Staff

Fundamental principles of neuropharmacology. Electrophysiological and biochemical techniques in studying neuropharmacology. Neurotransmitters and their pathways in central nervous system. Drug effects on various neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Pharm 205–6 or equivalent. (Spring, odd years)

285 **Readings in Pharmacology** (arr.) Mazel

For medical students. Assigned reading and preparation of report. (Fall and spring)

286 **Research in Pharmacology** (arr.) Staff

For medical students. Participation in experimental studies in pharmacology, particularly endocrinology, cancer chemotherapy, or drug metabolism. (Fall and spring)

287 **Readings in Drug Abuse Literature** (arr.) Cohn, Klubes

Both professional and nonprofessional literature in the general area of drug dependence. Informal monthly luncheon discussions. (Spring)

295 **Reading and Research** (arr.) Staff

Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general exami- May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Physiology

Chairman: R.A. Kenney

Professors C.S. Tidball, R.A. Kenney, M.E. Tidball, M.M. Cassidy
Professorial Lecturer D.O. Carpenter
Associate Professors M.J. Jackson, M. McCally, R.A. Lavine, D.W. Watkins
Assistant Professors M.J. McCrea *(Research)*, M. Frank
Assistant Professorial Lecturers I.P. Weiss, E.A. Steane, D. Forman, M. Katzper, K.R. Spring

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Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201.

111 **Physiology for New Health Practitioners** (3) Watkins
(Formerly HCS 111, Function of the Human Body)
For students in physician's assistant and nurse practitioner programs. Lecture, film, and demonstration. Function and process of the human body covering the major organ systems.

115 **Physiology for Nurse Anesthetists** (3) Staff
For students in nursing anesthesia. Emphasis on respiratory, cardiovascular, and autonomic nervous system physiology; a more general survey of other systems.

191 **Selected Topics in Human Structure and Function** (3) Kenney
Lecture (2 hours), laboratory (1 hour). Structural and functional basis of physiology. Undergraduate course, required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbia College students with approval of advisor. (Fall)

*201 **Physiology** (8) Staff
Lecture (8 hours), laboratory (2 hours), conference (1 hour). Cellular, organ system, and applied human physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 201 or 221–22 (Bioc 221 may be taken concurrently); or consent of chairman of department. Open to consortium students only with permission of department chairman. (Spring)

205 **Cell Biophysics** (2) Jackson
Introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. Required for graduate students intending to take Phyl 201. Students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11 12 or equivalent, and consent of instructor. Open to students in Columbia College with approval of advisor. (Fall)

* Required for medical students, open to graduate students.

212 **Neurobiology** (3) **Staff**

For graduate students. Same as Anat 212 and Idis 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221 **Seminar** (1) Cassidy

Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

223–24 **Biomedical Instrumentation** (4–4) **Staff**

Same as Bioc 225–26 and Micr 240–41. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification, and quantification of materials of interest to biomedical and forensic scientists. Labratory fee, $50. (Academic year)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy

Discussion of principles of fluid and acid-base balance and the application of these principles to specific situations. (Fall)

260 **Membrane Physiology** (1) Jackson

Systematic review of the factors which determine the movements of water and solutes across simple cellular membranes and complex epithelial barriers in animal tissues. Prerequisite: Phyl 190 or permission of instructor. (Fall)

261 **Gastrointestinal Physiology** (1 or 2) Jackson, Dobbins

Weekly seminar; role of basic sciences in gastroenterology; intra- and extra-mural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney

Survey, at an advanced level, of aspects of cardiovascular physiology especially as interrelated with the respiratory and renal systems. (Fall)

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine

Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior and sensory processing. Admission by permission of instructor. (Fall)

270 **Computer Utilization in Physiology and Medicine** (3) C. Tidball

(Formerly Phyl 268)

Lecture one hour a week, practical experience at student's convenience. Orientation to digital and analog mini-computers. Programming in several languages. Experience with one or more computers. No previous computer experience necessary. (Fall)

282 **Experimental Physiology** (5) **Staff**

Participation in an ongoing research program in the department. Programs are currently available in the areas of membrane physiology, intestinal

transport, neurophysiology, and cardiovascular physiology. 4-week elective periods.

284 **Advanced Physiology** (5) Staff
Guided study or laboratory experience at an advanced level in a subfield of physiology. Prior arrangements should be made with the individual faculty member. 4-week elective periods.

290 **Extramural Physiology Elective** (arr.)
The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department. Staff

295 **Research** (arr.)
By special arrangement with individual staff members. Approximately four clock hours in the laboratory for each semester hour of credit. (Fall and spring) Staff

298 **Comprehensive Physiology** (arr.)
Guided review of selected areas of physiology appropriate to the student's graduate program. This course satisfies the requirements for the Master's Comprehensive Examination, the Field Examination for doctoral students minoring in physiology, and Part I of the Cumulative General Examination. Prerequisite or concurrent registration: Phyl 221. (Fall) Staff

299–300 **Thesis Research** (3–3)
(Fall and spring) Staff

396 **Advanced Reading and Research** (2)
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in physiology. (Fall and spring) Staff

397 **Development of Dissertation Problem** (2)
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problem. This course satisfies the requirement for Part III of the Cumulative General Examination in physiology. (Fall and spring) Staff

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring) Staff

Psychiatry and Behavioral Sciences

Chairman: J. Wiener

Professors L. Yochelson, J.E. Rankin, T.G. Webster, D. Reiss, J. Wiener
Adjunct Professor M. Levine

Clinical Professors T.D. Noble, S. Berman, M. Kleinerman, M.deG. Ruffin, N. Taub, L. Ferber, P. Gray, P. Chodoff, H.A. Meyersburg, F.N. Waldrop, H. Weiner *(Experimental Psychology)*, H. Resnik, J.D. Noshpitz, W. Stark, B. Brown, H.H. Work, H. Jason, L. Cytryn, E.I. Kushner, J. Kafka, M. Meltzer, J. Spurlock, M. Katz, C.T. Bever, S.L. Baker, Jr., S. Perlin, G.R. Ticho, R.L. Shapiro, E.A. Hargrove, B. MacLennan, R.E. Reiger

Professorial Lecturer H.D. Lederer

Associate Professors J.J. McMillan *(Psychology)*, W.H. Scott, R. Kurz

Associate Professorial Lecturer G.E. Morris *(Allied Health Science)*

Associate Clinical Professors H.P. Laughlin, I.H. Kaiser, D. Eden, S.I. Szara *(Psychopharmacology)*, J.G. Rubin, E.S. Fleming, R.M. Greenberg, W.D. Kehne, J.L. Sheridan, J.H. Yacoubian, J. Durell, B. Olshaker, H.B. Lehrman, I.H. Marill, T.D. Reynolds *(Experimental Psychiatry)*, P.S. Weisberg, C.J. Frederick *(Medical Psychology)*, L.D. Robinson, A.S. Abraham, B.C. Straight, J.J. Francis, A. D'Agostino, W.J. Stockton, R. Peele, J.T. Quattlebaum, D.D. Cowell, M.R. Haas, R. Dupont, Jr., B. Wedge, P.F. Wohlford, J.H. Menetrez, B.L. Burris, C.C.H. Cullander, D.L. Tippett, A. Ward, Jr. *(Sociology)*, H.S. Winston, J.E. Meeks, J. Smith, R.M. Coleman, R.N. Butler, M.J. Stern, G. Scarcella, J.B. Erdman, J. Zinner, C.B. Robinowitz, F.M. Ochberg, S.J. Wolin, L.W. Allen, B.M. Hamburg

Assistant Professors B.B. Doyle, J.A. Frank, Jr., P.J. Steinglass, D.I. Davis, K. Ravenscroft, Jr., L. Sank, R.B. Gerber, J.J. Katzow, C.B. Feinstein, M. Hertzman

Adjunct Assistant Professors A.T. Billett *(Social Work)*, M.M. Reynolds *(Social Work)*, R.S. Richmond *(Social Work)*

Assistant Clinical Professors S.S. Tenenblatt, R.A. Rogers, J.A. Farrell, F.G. Hilkert, I.D. Milowe, W.C. Johnson, R.A. Frank, L. Schaffer, T.M. Mackenzie, C.W. Kehne, M.A. Woodbury, W.H. Young, Jr., J.H. Bouma, S. Gordon, Jr., D.A. Lanham, S. Mourat, S.L. Auster, H.A. Greenberg, G. Cotts, M.L. Garrett, H.A. Hoffman, J.M. Post, R.A. McElroy, F.B. Thomas *(Social Work)*, B. Crowley, B.P. McKaig, W. Davidson, J.A. Schoettler, S. Weissman, M.S. Glatt, A.E. Marans, E.S. Denham, P.B. Holly, D.H. McKnew, Jr., L.A. Cove, M. Engel, J.L. Evans, L. Dizmang, B. Pakull, C.R. Gray, M.J. Chalick, G. Schaeffer, R.T. Lewit, A.M. Messore, W.F. Weber, R.W. Wadeson, Jr., M.T. Advani, E. Black, D.H. Fram, A.B. Zients, G.A. Tripp, M. Brody, D. Grodsky, K.L. Kaplan, D.D. Pollock, A. Saenz, E.A. Sorrentino, E. Taylor, S. Greenspan, B. Kraff, D.Y. Patterson, M.R. Goldberger, D.J. Gardner, R.L. Gross, J.L. Wellhouse, J.W. Voell, J.R.S. Malkin, R.A. Ratner, D.R. Meers, S.H. Lipsius, B. Landau, A.H. Stein, L.R. Conte, B.L. Frankel, P.A. Lange, N.A. Schweig, S.L. Billet, J.C. Chatel, K.P. Gorelick, R. Hirschfield, H. Steinberg, R.C. Bristol, R.M. Costell, M.D. Fitz, R.M. Auster, L.D. Levi, S.L. Goodman, G.D. Legler, S.A. Savitz, W.F. Thompson, M. Giller, J.A.F. Chused, J.R. Sealy, S.K. Kolansky, R.A. Nover, S. Rosenblum, D.E. Scharff, J.L. Read, S.R. Piecznik, G.A. Ellsworth, D. Charney, E.C. Holscher, Jr., C. Goldberg *(Psychology)*, P.E. Chanel, D.T. Mosher, A. Olaciregui, T. Craig, M. Boverman, D.I. Joseph, L.E. Kruez, D.G. Lipman, R.B. Posner, N.L. Wilson, G.H. Miller, H.W. Rice, C. Goldberg, J.P. Waletzky, L. Turner, K. Kessler, J. Barber, D.A. Block, D.A. Dansak, R.C. Eisner, C. Frank, J.H. Herzberg, E.J. Leiberman, W.B. Mendelson, R.R. Palmer, R. Teitel, H.R. West

Assistant Professorial Lecturers A.S. Fonaroff, A. Zappala

Instructors M.E.P. Oliveri *(Research—Psychology)*, D.C.T. Choate *(Social Work)*, I.S. Baron-Starke *(Psychology)*, L.A.M. Bennett

Adjunct Instructors S.S. Lynn, E.K. Wolf *(Social Work)*, N.B. Delston, G.K. Palys

Clinical Instructors H. Plotsky, W.H. Dobbs, W.A. Hamman, S.E. Samenow *(Psychology)*, E.W. Cotlove, K.L. Owens *(Social Work)*, A.H. Reese *(Social Work)*, R.G. Ammerman, R.M. Kapit, B.S. Arons, E.C. Bergman, C.T. Chastek, I.M. Chatoor-Koch, M.M. Clancy, B.C. Gorman, M.W. Gross, R.W. Keisling, C.I. Margolis, N. Sacirbey, A.R. Sager, A.J. Saleri, P.J. Santora, S.W. Skoler, B.M. Smoller, C.J. Weyland

Lecturer J.D. Robinson *(Visiting—Psychology)*

Special Lecturers J. Hoffman, J.B. Chassan *(Biostatistics)*, P. Hamosh, D. Schuyler, R.L. Siegel, M.M. Herenda, S.L. Aledort

All clinical courses are five credit hours per four-week period.

*252 **Psychological and Social Factors of Medical Practice** Reiss and Staff
(Formerly Development of the Person)
For first-year medical students. Basic presentation of normal personality development. Principals of psychological aspects of human growth and development. (Spring)

*301 **Introduction to Clinical Problem Solving** Dunn and Staff
For second-year medical students. Mental mechanisms, psychopathology, introduction to psychiatric syndromes, clinical interviewing, behavioral sciences in clinical medicine. (Fall)

*302 **Clinical Clerkship** Webster, Giller, Hoffman, Ryder and Staff
Supervised examination, diagnosis, out-patient and in-patient treatment at University, St. Elizabeths, Childrens, and Washington V.A. Hospitals and Psychiatric Institute. Case conferences, seminars on psychiatric referral, "psychiatric" drugs, community resources. Psychiatry in general practice stressed. (Fall and spring)

351 **The Role and Professional Identity of the Physician** Reiss and Staff
Small group discussions exploring the personal and social factors of the physician's role. Limited to 10 first-year medical students per group. (Spring)

353 **Basic Psychoanalytic Concepts; Clinical Illustrations** Staff
(Formerly Basic Psychoanalytic Concepts)
Basic psychoanalytic concepts such as dreams, transference phenomena, and the various components of personality structure. Participation in discussions focusing on psychoanalytic issues and the relevance of such concepts to the practice of medicine in general. For first- or second-year medical students. Wash. Psychoanalytic Soc. Bldg. (Spring—eight two-hour sessions)

* Required for medical students.

365–66 **Seminar: Clinical Introduction to Family Diagnosis and Therapy** (3–3) — Steinglass, Reiss, and Staff

Open to medical students and advanced students in clinical psychology.

381 **Psychiatric Research: Human Development** — Meyersburg

Readings in human development. Direct observation and experience with normal and disturbed developmental sequences in a children's day-care setting. Videotaping. Weekly seminar.

382 **Clinical Psychiatry** (5) — Giller

Clinical care of patients hospitalized for emotional and mental disturbances; individual and group therapy, somatic therapies, psychodrama. 4-week elective periods. St. Elizabeths Hosp.

383 **Psychiatric Day Care** (10) — Staff

Evaluation of patients referred for day care and of various activities and programs in the day-care center. Research pertaining to the day-care center's role in the treatment of psychiatric patients. 8-week elective periods. Psychiatric Inst. of Wash.

385 **Schizophrenic Reactions** (5) — Bullard,* Margolis

Observation and study of the administrative management and treatment of patients. Staff meetings, selected readings, individual instruction, complete case write-ups. 4-week elective periods. Chestnut Lodge, Rockville, Md.

386 **Psychiatric Research** (5) — Staff

Participation in research programs involving clinical and experimental investigations of human behavior. 4-week elective periods. St. Elizabeths Hosp.

387 **Clinical Psychiatry** (5, 10, or 15) — Webster and Staff

Students perform as acting interns; admit patients, work with treatment team, organize treatment plan and treat patients in cooperation with and under supervision of other treatment team members. Emergency room and consultation work is desired. Students will attend all resident didactic courses. 4-, 8-, or 12-week elective periods. Univ. Hosp.

389 **Psychiatric Day Hospitalization** — Crowley

Participation in the diagnostic and treatment programs of a separate and independent day hospital designed to prevent and replace full-time psychiatric hospitalization. Research in partial hospitalization. One to three 4-week elective periods. Potomac Foundation for Mental Health.

390 **Extramural Psychiatry Elective** (arr.) — Webster and Staff

The department may arrange for students to spend elective periods at other institutions. Interested students should contact Dr. Webster.

391 **Research: Constitutional Psychiatry and Psychiatric Aspects of Criminal Behavior** (5 or 10) — Peele and Staff

(1) Somatotypy, genetics, encephalography; emphasis on criminal behavior. (2) Detailed study of the social and anthropological factors producing criminal behavior; psychologic testing. 4- or 8-week elective periods. St. Elizabeths Hosp.

* Dr. Bullard is Senior Consultant at Chestnut Lodge.

392 **Administrative Psychiatry** (5) Robinson

First-hand experience with psychiatry and mental health concepts relating to new legislation, recent court decisions regarding the right to treatment, commitment, quality assurance, funding, PSRO. Open to two seniors. 4-week elective periods. St. Elizabeths Hosp.

393 **Independent Studies** (5) Webster and Staff

Clinical or research experience and instruction in aspects of psychiatry not included in clerkship; selections on basis of individual student interest. 4-week elective periods. Univ. Clinic and elsewhere, individually arranged.

394 **Elective in Forensic Psychiatry** (5) Saiger

Work in the rehabilitation of criminal offenders. 4-week elective periods. St. Elizabeths Hosp.

395 **Substance Abuse** Davis

Individualized program dealing with drug and alcohol abuse. GWU Center for Family Research. Clinical and research experience.

396 **Alcoholism: In-patient Treatment** (5 or 10) O'Neill

Participation in evaluation and treatment of patients hospitalized for chronic alcoholism. 4- or 8-week elective periods. V.A. Hosp.

397 **Family Medicine** (5) Sank

Working with medical outpatients who require some form of psychiatric intervention or evaluation of a brief nature. 4-week elective periods.

398 **Alcoholism: Out-patient Treatment** Advan

In-patient and out-patient care in all stages of alcoholism. Interested students should make arrangements with the instructor. Psychiatric Inst. of Wash.

401 **Residential Treatment for Disturbed Adolescents** Auste

Participation in staff activities in a residential treatment facility for disturbed adolescents. Open to one student; those interested should contact the instructor.

402 **Out-patient Psychiatry** Webster and Staff

Open to two seniors. Participation in evaluation and treatment of selected psychiatric out-patients in the OPD of the Ambulatory Care Division.

403 **Psychiatric Day Care: The Adolescent Patient** Quattlebaum

Open to two seniors. Partial hospitalization of adolescent patients. Participation in patient management. Psychiatric Inst. of Wash.

404 **Medical and Legal Project on Aging** (15) Smith

Students, together with lawyers and National Law Center students, evaluate and prepare cases for presentation before the Social Security Administration on behalf of indigent elderly clients. Screening and evaluation of clients with mental health problems. Preparation of medical evidence for use in legal proceeding. Open to five fourth-year medical students. 12-week elective periods.

405 **Child Psychiatry** Wiener and Staff

Open to two seniors. Externship in child psychiatry. Psychiatric consulta-

tion to various pediatric wards. Out-patient evaluation and treatment of child psychiatric patients and their families. Children's Hosp.

406 **Family Studies** Boverman

Study of families needing psychiatric help for illnesses. Open to one senior; those interested should contact the instructor.

407 **Forensic Psychiatry** (10 or 15) Ward

Supervised research in the training and research divisions of forensic programs. Open to two seniors. 8- or 12-week elective periods. St. Elizabeths Hosp.

408 **Psychiatry on the Gerontology Service** (5) Lange, Hoffman

Work on a short-term, multi-disciplinary treatment center for gerontological patients. The focus is on comprehensive evaluations, working with the family, and effective discharge planning. Open to one senior; 4-week period.

409 **Child Psychiatry in Community Mental Health** Stein

Diagnostic and short-term work with emotionally disturbed adolescents and children at the Therapeutic Day School and Nursery School, Area B Community Mental Health Center.

410 **Identity Struggles and Mental Illness** Lipman

Various approaches to crisis intervention with particular emphasis on personality development and forms of mental illness. (Limited to six students.)

411 **Group Therapy** Weisberg

Combined didactic and participatory course in group therapy. Students will function as observer-members of on-going group, and will participate in lecture-supervision sessions.

412 **Mental Health Issues for Deaf People** Robinson

This course enhances the student's understanding of mental health and illness from the perspective of auditory deprivation. A combination of the didactic method, discussion, films, and field trips to educational and mental health facilities for deaf people are combined with varying degrees of practical and research involvement.

413 **Autobiographical and Fictional Accounts of Madness** Gorelick

Reading of a variety of personal accounts—some fictional, others autobiographical—of the inner experience of madness. Works include *Breakdown* by Robert Dahl and *50 Minute Hour* by Robert Lindner. St. Elizabeths Hosp.

414 **History of Mental Illness and Therapeutics** Gorelick

Consideration of the historical periods of primitive healing, Greek medicine, Arabic medicine, Christian healing, witchcraft phenomena and key developments of the last 200 years.

415 **Identity and Role of the Physician** Robinowitz

The role and identity of the physician, with special emphasis on women physicians. Didactic material on the role and identity of the physician combined with experiential models, including group dynamics.

416 **The Application of Psychoanalytic Principles to the Practice of Medicine** — Kaiser

Offered by the Extension Division of the Washington, D.C., Psychoanalytic Institute.

417 **Geriatric Psychiatry** — Legler

Students accompany preceptor who functions as geriatric consultant to the National Capital Housing Authority.

Radiology*

Acting Chairman: D.O. Davis

Directors of Divisions: A.C. Wyman *(Acting, Diagnostic Radiology)*, R.C. Reba *(Nuclear Medicine)*, D.J. Goodenough *(Radiation Physics)*, C.C. Rogers *(Radiation Therapy)*

Professors S.D. Rockoff, J.G. Maier *(Radiation Therapy)*, D.O. Davis, W.J. McSweeney, C.C. Rogers *(Radiation Therapy)*, C.W. Ochs, R.C. Reba *(Nuclear Medicine)*, A.M. Lewicki, B.J.L. Sauerbrunn *(Nuclear Medicine)*, V.M. Varma

Clinical Professors A.C. Wyman, M.M. Reeder, J.L. Doppman, J.J. Smith *(Nuclear Medicine)*

Professorial Lecturer J.R. Andrews

Associate Professors M. Majd, K. Poulose *(Research—Nuclear Medicine)*, W.C. Eckelman *(Radiopharmacology)*, T.L. Lawson, D.L. Breckbill, J.A. Deye *(Radiation Physics)*, M.E. Bradley *(Research)*, D.J. Goodenough *(Radiation Physics)*, R.O. Bondelid *(Research)*, E.W. Bradley *(Research Radiobiology)*, R. Gordon *(Research)*

Associate Clinical Professors H.J. Kicherer, C.F. Murphy, W.J. Nelson, G.J. Augustin, J. Burwell, J.D. Marriott

Assistant Professors S.N. Lee *(Radiation Therapy)*, B. Potter, N.J. Smith *(Radiation Therapy)*, P.T. Kirchner, L.R. Goodman, W.J. Rzeszotarski *(Research—Nuclear Medicine)*, K.E. Weaver *(Radiation Physics)*, T. Padikal *(Radiation Physics)*, L.S. August *(Research)*, R.M.S. Beck *(Radiologic Technology)*, D.R. Brallier, R.E. Gibson *(Research)*, T. Komai *(Nuclear Medicine)*, M.S.L. Lesar, G.E. Miller *(Research)*, R.D. Ornitz, C.H. Paik *(Nuclear Medicine)*, A.J. Roach, P. Shapiro *(Research)*, R.B. Theus *(Research)*

Adjunct Assistant Professor E.G. Briefel *(Radiation Physics)*

Assistant Clinical Professors M.D.M. Faris, A.S. Cigtay, M.A. Thomas, F.V. Schumacher, R.J. Lull, R. Blumhardt, M.C. Johnson, E.R. Jacobs, V. Mc-Manaman *(Nuclear Medicine)*, J.A. Russotto, J.P. Green *(Nuclear Medicine)*, W.H. McCartney *(Nuclear Medicine)*, F.H. Gerber, S.J. Kurzbard, C.M. Citrin, M.E. Siegel *(Allied Health Science)*, R.F. Carretta, P.F. Abraham, F.S. Bilek *(Radiation Therapy)*, D. Feigin, N. Ghaed, T.J. Joseph, B.T. Katzen, M. Rosenstein

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* Unless otherwise indicated, all faculty appointments are in the *Diagnostic Radiology* division.

Instructors N.L. McElroy *(Radiation Physics)*, J.N. Albarelli *(Diagnostic Ultrasound)*, A. Castagnolo *(Allied Health)*, V.V. Cherico *(Nuclear Medicine)*

Clinical Instructors G. Tievsky, S.M. Perl, L. Wener, R.J. Morton, Jr., E. Westbrook, J.L. Murray, M.J. Duea, W.B. Lowe, C.M. Richardson

Special Lecturers R.G. Conant *(Nuclear Medicine Technology)*, W.E. Fulps, J.C. Hergenrother *(Nuclear Medicine Technology)*, W.F. Mellen, J.L. Firoved *(Nuclear Medicine Technology)*, H.F. Midkiff *(Nuclear Medicine Technology)*, J.A. Waliszewski *(Nuclear Medicine)*, J.H. Coenen *(Nuclear Medicine Technology)*, B.A. Kendall *(Nuclear Medicine Technology)*, L.R. Oly, H.L. Hise, Jr. *(Nuclear Medicine Technology)*, W.J. Weiler *(Nuclear Medicine Technology)*, J.H. Arthmann *(Nuclear Medicine Technology)*, C.E. Boccia, P.F. Jensen *(Nuclear Medicine Technology)*, J.W. Andrews *(Nuclear Medicine Technology)*, M.G. Withrow, Jr., S.L. Horst, R.A. Mollett, C.J. Zimmerman, Jr., R.W. Carlson, J.S. Thorkelsen, D.E. Easterbrooks III, G.W. Elliot, R.M. Fisher, R.W. Jones, T.J. Schmitz III, J.A. Shive

Courses numbered 40 through 190 are limited to students in the Associate in Science and Bachelor of Science degree programs in radiologic technology, nuclear medicine, and radiologic science and administration.

40 **Clinical Training and Experience in X-ray Technology I** (2) — Gerber, Marriott

Instruction and close supervision in the use of radiologic techniques to examine the digestive, urinary, female reproductive, central nervous, and circulatory systems; chest and abdomen radiography, orthopaedic radiography, ENT and neurologic radiography, portable radiographic examinations, pediatric radiography, nuclear medicine, radiation therapy.

41 **Clinical Training and Experience in X-ray Technology II** (2) — Gerber, Marriott

Prerequisite: Rad 40.

42 **Clinical Training and Experience in X-ray Technology III** (2) — Gerber, Marriott

Prerequisite: Rad 40, 41.

43 **Clinical Experience in Nuclear Medicine I** (4) — Reba and Staff

Practical study and supervised performance; emphasis on indications and contraindications, procedures and methods, physiological and procedural factors which may result in a false study, radiation safety techniques, and administrative procedures.

44 **Clinical Experience in Nuclear Medicine II** (5) — Reba

Prerequisite: Rad 43.

50 **Radiologic Anatomy I** (4) — Zimmerman, Duea

Human anatomy as applied to radiologic terminology. Structure and function of the human skeleton and topographical anatomy, both normal and pathological.

51 **Radiologic Anatomy II** (4) — Zimmerman, Duea

Human anatomy as applied to radiographic procedures. Structural and functional approach, application to radiography of the digestive, respirato-

ry, excretory, endocrine, reproductive, and nervous systems and the organs of special sense. Some discussion of medical and surgical diseases. Prerequisite: Rad 50.

55 **Stationary and Rectilinear Imaging** (3) Thorkelsen

Related anatomy, physiology, and pathology of imaging procedures; basic methodology of these and related procedures, including bone, brain, liver, liver function, bone marrow, lung, liver-lung, transmission, cardiac blood pool, cisternography, spleen, parathyroid, pancreas, lung ventilation, parotid ventriculography; miscellaneous scans; brain and cardiac flow studies

56 **Hematologic and Radionuclide Dilution Procedures** (3) Carlson

Related anatomy, physiology, and pathology of hematologic and radionuclide dilution procedures; basic protocol for these procedures, including plasma volume and related plasma studies, red cell volume and related red cell studies, studies of iron metabolism, and the placental localization and scanning.

57 **Organ Concentration-Excretion Measurements** (3) Hergenrother

Related anatomy, physiology, and pathology of organ concentration-excretion measurements; the procedure for those measurements, including thyroid uptake and its variations, thyroid scan, metastatic chest survey, renogram, renal scan, and renal flow study.

58 **Gastrointestinal Absorption Measurements** (1) Thorkelsen

Related anatomy, physiology, and pathology of gastrointestinal absorption measurements; the procedure for those measurements, including fat absorption studies (triolein and oleic acid) and the three stages of the vitamin B-12 absorption study (Schilling test).

59 **Competitive Binding Radioimmunoassay** (2) Weiler

Basic concepts of radioassay; basic procedure for any competitive binding radioassay. Specific concepts and procedure for T3, T4, and serum B-12 determinations; factors affecting those determinations and the interpretation of their results.

60 **Radiographic Technique I** (4) Easterbrooks, Schmitz

Theoretical and practical study of x-ray machines, equipment, patient positioning, and radiographic qualities; history and development of x-ray, phototiming, x-ray tubes, and Bucky grids and their uses; anatomical landmarks, radiographic terminology, exposure factors, and variations; radiographic calibration (quality and quantity); marking of films and factors governing good film quality. Laboratory work.

61 **Radiographic Technique II** (4) Easterbrooks, Schmitz

Preparation of exposure charts and use of radiation protection devices; practical applications of technical uses of stationary and portable equipment under supervision; techniques for pediatric radiographs and methods of positioning and restriction; intra-oral radiography techniques. Photofluorographic chest units, departmental floor plans, basic office procedures. Laboratory work. Prerequisite: Rad 60.

62 **Darkroom Technology** (3) Zimmerman, Fisher

Processing of film after exposure; care and handling of conventional and automatic darkroom equipment; types of film, handling and storage; mixing and handling of chemicals and the action and quantity of these chemicals in

the processing of film; effects of heat and cold on these chemicals, diagnosing of various improper developing techniques. Laboratory work.

65 **Basic Chemistry** (3) Weiler

Introduction to basic chemistry: kinds of matter, atomic structure, the periodic table, chemical bonding, formulae and equations, solutions, acid-base reactions; introduction to organic chemistry and biochemistry; laboratory sessions.

66 **Radiopharmaceuticals** (3) Weiler

Uses of radionuclides in medicine, basic principles of a Mo-99/Tc-99m generator, radiopharmaceuticals and their action within the body, preparation of radiopharmaceuticals using generator-produced nuclides, quality control, accountability, procurement, clinical orientation.

70 **Electronics of Radiology I** (4) Elliot, Schmitz

Fundamental concepts of electricity such as battery types and construction, power and energy, simple circuits, series/parallel circuits, compound circuits. Description and function of various components of the circuits such as resistors and capacitors, magnetism and alternating current, magnetism and inductance, inductance and capacitance, and capacitance and transformers. Laboratory work.

71 **Electronics of Radiology II** (4) Elliot, Schmitz

Applications of electronic principles to x-ray equipment and components; transformers, meters, generators, rectifiers, basic electronics; electron tubes and solid state devices; equipment trouble-shooting and maintenance. Laboratory work. Prerequisites: Rad 70.

72 **Radiation Instrumentation** (5) Thorkelsen

Theoretical and practical aspects of radiation detectors: types, components, and operation of detectors; collimators; geometry; introduction to rectilinear scanning; introduction to stationary imaging; clinical orientation.

75 **Fundamentals of Atomic and Nuclear Physics** (3) Hergenrother

Basic units, quantum theory, Bohr theory, atomic and nuclear structure, radioactivity and decay, alpha and beta particles, electromagnetic radiation, series decay, radioactive equilibrium, I.C.R.U.

80 **Mathematics of Radiology** (3) Boccia, Duea

Principles of mathematics as applicable to the physics of radiologic technology; use of the slide rule, including multiplication, division, powers, and roots; solution to linear equations in the unknown; cartesian coordinate plane; slope of straight line; determining linear equations from given conditions; graphic solution of two or more linear equations.

81 **Basic Mathematics** (3) Carlson

Review of basic high school mathematics, basic algebra, common and natural logarithms and their manipulation, linear and logarithmic graphing and manipulation of a log-log slide rule.

82 **Applied Technical Mathematics** (3) Carlson

Mathematics as applicable to nuclear medicine. Basic decay formula and its variations, calculation of doses of radionuclides, basic statistics terminology, frequency distributions, confidence limits, standard error, efficient distribution of counting time, statistics relating to rectilinear and stationary imaging.

90 **Ethics** (1) Zimmerman, Fisher

Ethics of physician/technician/patient relationships. Responsibilities, both moral and legal, to physician and patient; the rapport expected of the technologist.

91 **Special Projects in Radiology** (arr.) Staff

Independent study on an aspect of radiology worked out between the student and the instructor.

92 **Basic Physics** (3) McElroy

Developmental course for students weak in physics and mathematics training. Includes basic atomic structure, practice in computation, electro and magnetic statics, motors, transformers, concepts of electricity, and circuits. Introduction to radiological physics including radiation protection, radiological units, and interactions of radiation with matter.

93 **Radiobiology and Radiation Dosimetry** (3) Carlson

Interaction of radiation with matter; radiation effects on molecular, cellular, tissue, and organ levels; genetic and somatic effects of ionizing radiation; classical and M.I.R.D. methods of absorbed dose calculation.

94 **Radiological Safety** (3) Weiler

Introduction to radiation safety; units of radiation exposure and dose; licensing; NRC regulations; accountability and records, receipt, storage, handling, transportation, and disposal of radioactive materials; monitoring; shielding; dose-distance relationships; personnel dosimetry; radiation illness; radiac instruments; radiation safety clothing; radioactive "spill" procedure.

95 **Radiation Safety** (3) Jones, Mellen

Radiation tolerance, safety, and reporting photodosimetry; protective methods, control devices, shielding, half-life, detection, detection equipment, design and operation, thermoluminescence (its operation and uses), terminology and subject matter. Laboratory work.

96 **Radiation Biology** (3) Jones, Mellen

Effects of radiation on basic cell structure through organ and whole-body exposure; nature of radioactive particles and emissions, their effects on biological materials at the cellular and organismic level, particularly on the mammalian systems.

97 **Special Procedures** (3) Boccia, Duea

Techniques of radiology employing contrast media. Fluoroscopy, spot films, body section radiography, pelvimetry, placentography, location of foreign bodies in the eye, angiography, O.R. techniques, oral procedures, stereoscopy, pediatric angiographic procedures. Prerequisite: Rad 61, 71.

98 **Therapy Procedures** (1) Thorkelson

Introduction to radiation therapy and radium implants. Related anatomy, physiology, and pathology of phosphorous–32 and iodine–131 therapies and the technologist's responsibilities concerning them.

99 **Survey of Radiation Therapy and Nuclear Medicine** (3) Jones, Murray

Principles and practices of x-ray therapy and nuclear medicine techniques

purpose of radiation therapy and radioisotopes, their application and uses. Types of equipment and design. Prerequisite: Rad 51, 61, 71, 95, 96.

140 **Radiology Administration** (4) Staff

Key areas of administration: human skills, technical skills, and conceptual awareness as they pertain to radiologic management at the department level. Traditional management concepts and models developed through modern texts and current journals which address the topics of organizational behavior, planning, controlling, etc. Discussion and exploration of the logistics of managing a radiology section. Prerequisite: HCA 135, 142, 153, 156.

145 **Administrative Project: Diagnostic Radiology** (3) Staff

For students concentrating in diagnostic radiology. Students identify, develop, and complete a project for a radiology department using administrative principles. Prerequisite: Rad 140.

147 **Administrative Project: Nuclear Medicine** (3) Staff

For students concentrating in nuclear medicine. Students identify, develop, and complete a project for a nuclear medicine department using administrative principles. Prerequisite: Rad 140.

149 **Administrative Project: Radiation Therapy** (3) Staff

For students concentrating in radiation therapy. Students identify, develop, and complete a project for a radiation therapy department using administrative principles. Prerequisite: Rad 140.

150 **Radiology Senior Study** (2) Goodenough and Staff

Independent study for radiologic sciences and administration students. Faculty monitor acts as consultant to projects and gives minimal guidance. Project reports must be submitted for evaluation.

167 **Radiation Physics and Safety I** (3) Goodenough and Staff

Concepts of matter and energy and electromagnetic radiation. Mechanisms in the production of x-rays and x-ray circuits, including half-wave and full-wave rectification and three-phase generators. Interaction of radiation with matter, emphasizing the photoelectric, Compton, and pair-production effect. Radiation detection and dosimetry, Roentgen rad and rem units of radiation. Radiation safety as applied to diagnostic radiology, nuclear medicine, and radiotherapy, including effects of time, distance, and shielding. Maximum permissible concentrations, internal dose problems.

171 **Radiological Electronics and Engineering** (3) McElroy

Introduction to basic electronics and the operation, limitation, use, and principles in the selection of instrumentation. Transistors, power supplies, amplifiers, major circuit components of radiation detection instruments, gamma camera and rectilinear scanners, radiotherapy orthovoltage and linear accelerators, and diagnostic radiography equipment.

175 **Physics of Radiological Imaging** (3) Goodenough and Staff

For students concentrating in diagnostic radiology. Image formation and transmission through radiological and related photo-optical devices, utilizing system analysis techniques. Concepts of sensitivity, contrast, and modulation transfer functions. Description and analysis of photo receptors, including film grids and Bucky and intensifier screens. Radiographic development process. Fluoroscopy, cine radiography, and video techniques; image

storage electronic radiography; and solid state imaging panels. Ultra sonography and thermography. Demonstrations and experiments in control and evaluation of radiologic imaging. Prerequisite: Rad 167.

176 **Physics of Nuclear Medicine** (3) Goodenough and Staff

For students concentrating in nuclear medicine. Concepts of radioactivity, including beta decay, isomeric transitions, electron capture, internal transition, alpha decay, and the auger effect. Isotopic half-life secular and transient equilibrium. Artificial transmutations, nuclear reactions, counting statistics, and selection of instrumentation. Scintillation spectrometry techniques. Rectilinear scanners, gamma camera, and computer technology in nuclear medicine. Demonstrations and experiments in control and evaluation of imaging. Prerequisite: Rad 167.

177 **Dosimetry in Radiation Therapy** (3) Goodenough and Staff

For students concentrating in radiotherapy. Concepts of depth dose, isodose curves, and tissue air ratios for different energies, TSD, and field size. Techniques of treatment planning for stationary, multiple, and moving portals for Co-60 and megavoltage linear accelerators. Concepts of wedge fields and compensation for multiple TSD surfaces and tissue inhomogenities. Dosimetry of linear sources. Quimby and Paterson Parker dosimetry systems. Computer techniques in radiotherapy. Introduction to the dosimetry of electrons, neutrons, and the heavy particles. Demonstrations and experiments illustrating dosimetric principles. Prerequisite: Rad 167.

190 **Radiobiology** (3) Bradley

Advanced course in biological aspects of radiation. Chemical, physical and genetic effects of radiation on cells and organisms. Radioecology, safety, and health. Legal aspects of control. Prerequisite: Rad 93 or 96.

195 **Directed Study in Radiation Physics** (2) Goodenough and Staff

Projects in selected specialty demonstrating applications of radiation physics, imaging or dosimetric principles to radiographic quality control and evaluation of radiological equipment systems. Prerequisite: Rad 167; 171; 175 or 176 or 177.

383 **Clinical Radiology** (5) Wyman and Staff

Radiologic differential diagnosis; emphasis on the role of diagnostic radiology in clinical problem-solving. Each student is assigned a patient population and correlates the radiologic examinations with the clinical manifestations of disease. Students prepare brief clinical and radiological summaries and participate in procedures, case conferences with staff members, and interaction with medical and surgical staff members. Daily lectures and staff conferences. Audiovisual self-instructing material. 4-week elective periods. Univ. Hosp.

384 **Diagnostic Radiology** (5) Burwell and Staff

Participation in general radiography, fluoroscopy, and special procedures; interpretation of radiologic procedures with staff; review and study of teaching film file. Attendance at medical, surgical, and pediatric staff conferences. 4-week elective periods. Fairfax Hosp.

385 **Nuclear Medicine** (5) Reba, Varma, and Staff

Introduction to the physics of radioisotopes, radiochemistry, radiation detection, and instrumentation. Theory and operation of the nuclear camera and scanner. Study of organ imaging techniques, by lectures, conferences

and participation in patient care. Introduction to radio-immune assay. Correlation between clinical problems and nuclear diagnosis. 4-week elective periods. Univ. Hosp. and Wash. Hosp. Center.

386 **Radiation Therapy** (5) — **Maier and Staff**

Introduction to radiotherapeutic techniques, physics of high-energy radiation and instrumentation. Radiation treatment and correlated management of malignant diseases; emphasis on decision-making in a clinical practice. 4-week elective periods. Univ. Hosp.

387 **Subspecialty Diagnostic Radiology** (5) — **Staff**

Subspecialty offerings include pulmonary, gastrointestinal, urologic, obstetric and gynecologic, neurologic, and pediatric. 4-week elective periods. Univ. Hosp.

388 **Diagnostic Radiology** (5) — **Reeder and Staff**

Participation in general radiography, fluoroscopy, with special procedures; interpretation of radiologic procedures with staff; review and study of teaching film file; conferences. 4-week elective periods. Walter Reed Gen. Hosp.

389 **Diagnostic Radiology** (5) — **Ochs and Staff**

Same as Rad 388. 4-week elective periods. Nat'l Naval Med. Center.

390 **Extramural Radiology Elective** (arr.)

The department arranges for students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

391 **Diagnostic Radiology** (5) — **Schumacher and Stiff**

Same as Rad 388. 4-week elective periods. Wash. Hosp. Center.

Surgery

Chairman: **P.C. Adkins**

Directors of Divisions: P.C. Adkins *(General Surgery, Thoracic and Cardiovascular Surgery)*, R.D. Shapiro *(Oral Surgery)*, J.G. Randolph *(Pediatric Surgery)*, L.W. Thompson *(Plastic Surgery)*

Professors C.T. Klopp, G.S. Letterman *(Plastic Surgery)*, J.G. Randolph, P.C. Adkins, M. Mills, F.W. Plugge IV, J.E. McClenathan, W.J. Fouty, L.T. Bowles, P.E. Shorb, Jr.

Clinical Professors V.M. Iovine, G.A. Higgins, Jr., E.A. Gould, J.R. Thistlethwaite, N.H. Isaacson

Associate Professors H.C. Pierpont, T.C. Alford, N.T. Tsangaris, W.L. Joseph, L.W. Thompson, C.M. Herman, N.M. Rich, R.P. Altman, W.C. Dempsey *(Plastic Surgery)*

Associate Clinical Professors M.A. Schurter, N.P.D. Smyth, L. Gerber, D.H. Glew, Jr., R.W. Parsons, J.M. Keshishian, K.B. Absolon, W.D. Latham

Associate Professorial Lecturer L.E. Church *(Oral Surgery)*

Assistant Professors A.J. Slovin, K.D. Anderson, F.M. Midgley, P. Zamick *(Plastic)*, G.W. Geelhoed, D. Budd. W. Gee, L.E. Smith, R.C. Cochran, H.E. Ashworth, P.J. Corso, J.M. Giordano, A.H. Harken, D.L. Sturtz

Assistant Clinical Professors W. Ferguson, J.J. Weinstein, F.B. Brandt, J.W. Canter, L.R. Perna, S.M. Kirson, F. Sacasa *(Oral Surgery)*, R.D. Shapiro *(Oral Surgery)*, C.A. Silva, R.L. Flax, R.R. Cameron, H.F. Sears II, G.B. Helfrich, B.S. Teunis, S.M. Knoll, L.W. Gray, Jr., J.M. Garcia, J.R. Appleton, S.G. Crossland, B.F. Frankel *(Oral Surgery)*, J.M. Gitelman *(Oral Surgery)*

Clinical Instructors J.H. Sager, S. Holen *(Periodontics)*, R.S. Siegel *(Oral Surgery)*, C.L. Magassy *(Plastic Surgery)*, R.N. Scott

Special Lecturer J.H. Bayly

302 **Clinical Clerkship in Plastic Surgery** (2½) Staff
Two-week elective periods. Univ. Hosp.

•303 **Clinical Clerkship** (10) Staff
Eight weeks at Univ. Hosp. and Nat'l Naval Med. Center.

376 **Advanced Surgery** (5) Staff
Participation in total patient care, including operative procedures under close supervision. 4-week elective periods arranged at affiliated hospitals.

378 **Intensive Care Unit** (5) Absolon and Staff
Introduction to the management of acutely ill surgical patients, including cases involving trauma; neurosurgery; and cardiovascular-thoracic, abdominal, and orthopaedic surgery. 4-week elective periods. Wash. Hosp. Center

379 **Transplantation Immunology** (5) Geelhoed
Clinical renal transplantation and preservation. Daily teaching rounds, literature conference, seminar presentation, weekly surgical-medical nephrology rounds. 4-week elective periods. Univ. Hosp.

383 **Endocrine Surgery** (5) Geelhoed
Control of hyperfunction and neoplasms of thyroid, parathyroid, adrenal, and pancreatic islet cell glands. Collaboration with the endocrinology service for a balanced perspective on management of endocrine disorders. 4-week elective periods. Univ. Hosp.

384 **Thoracic-Cardiovascular Surgery** (5) Adkins
Basic principles used in thoracic and cardiovascular surgery. 4-week elective periods. Univ. Hosp. and Clinic.

385 **Plastic Head and Neck Surgery** (5) Thompson
Preoperative and postoperative care, operating room procedures, clinical activities, conferences. Aesthetic surgery, head and neck cancer, maxillofacial trauma, hand surgery, congenital anomalies about the head and neck, and burns. 4-week elective periods. Univ. Hosp. and Clinic.

386 **Pediatric Surgery** (5) Randolph
Participation in an active, closely supervised surgical service for infants and children, including congenital defects, cardiac surgery, trauma, and neoplasms. 4-week elective periods. Children's Hosp.

• Required for medical students.

387 **Plastic Surgery** (5) Thompson, Parsons
(Formerly Plastic Head and Neck Surgery)

Experience comparable to a surgical internship with integral participation in all activities of the service, including preoperative and postoperative care, operating room procedures, out-patient clinics, and conferences. Basic principles of wounds and their management, aesthetic and reconstructive surgery, and congenital anomalies. 4-week elective periods. Walter Reed Gen. Hosp.

388 **Plastic Surgery** (5) Thompson, Dempsey

Participation in an active plastic surgery service, principally aesthetic surgery, but also including other types of plastic surgery. Out-patient clinics, operating room procedures, and conferences. 4-week elective periods. Nat'l Naval Med. Center.

389 **Surgical Preceptorship** (5) Iovine, Thistlethwaite, Isaacson

Care of general surgical patients as seen in private practice. 4-week elective periods.

390 **Extramural Surgery Elective** (arr.)

The department arranges for students to spend one or more elective periods at other institutions. Students must have the approval of the chairman of the department.

392 **Peripheral Vascular Surgery** (5) Keshishian, Smyth, Slovin

Study and application of vascular surgery. 4-week elective periods. Wash. Hosp. Center.

395 **Experimental Surgery** (5) Geelhoed

Participation in existing research projects and experimental operative procedures; assigned reading. 4-week elective periods. Surgical Research Lab., Ross Hall.

Urology

Chairman: H.C. Miller, Jr.

Professors L.R. Culbertson, H.C. Miller, Jr.

Clinical Professors E.E. Ferguson, W.D. Jarman, F.J. Frensilli, F.T. Reuter

Associate Professors M. Edson, A.B. Belman

Associate Clinical Professors H.A. Goldberg, C. Rodriguez, J. Kenealy, B.T. Mittemeyer, W.L. Banfield III, H.S. Semerdjian

Assistant Clinical Professors G. Ottenberg, R.C. Rhame, G. Dudas, H.J. Klapproth, R.E. Ware, I.S. Young, E.H. Soifer, I.J. Spence, D.M. Seitzman, I. Shuman, D.T. Schwartz, F.B. Hendricks, H. Salcedo, M.P. Berger

Clinical Instructors B.O. Black, E.G. Abramson, J.B. Alperstein, W.L. Glover, Jr., S.O. Kazmi, H.E. Bondy, J.D. Francis, J.A. Gargurevich, P.L. Gross, M.I. Murdock, S.L. Werner

Reuter

380 **Clinical Urology** (5)

Out-patient and diagnostic urology, cystoscopy, and radiographic procedures. 2-week elective periods. Univ. Hosp.

Miller and Staff

381 **Clinical Urology** (5)

Observation of urologic conditions and procedures for diagnosis and treatment; radiologic and pathologic studies, endoscopy and surgery, collateral reading, weekly staff conference. 2-week elective periods. Univ., V.A., Children's Hosps., Nat'l Naval Med. Center, Walter Reed Army Medical Center.

Hendricks and Staff

382 **Clinical Urology** (5)

Observation of urologic conditions and procedures for diagnosis and treatment, radiologic and pathologic studies, endoscopy and surgery, collateral reading, weekly staff conference. 2-week elective periods. V.A. Hosp.

Edson

383 **Clinical Urology** (5)

Out-patient and diagnostic urology; cystoscopic and operative urology. 2-week elective periods. Nat'l Naval Med. Center.

390 **Extramural Urology Elective** (arr.)

The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

Staff

302 **Clinical Clerkship** (2½)

2-week elective periods. Univ. Hosp.

THE SCHOOL OF MEDICINE AND HEALTH SCIENCES

Faculty and Staff of Instruction*

EMERITI

Theodore Judson Abernethy, *Professor Emeritus of Clinical Medicine*
B.S. 1925, Denison University; M.D. 1929, Johns Hopkins University

Errett Cyril Albritton, *Professor Emeritus of Physiology*
B.A. 1916, University of Missouri; M.D. 1921, Johns Hopkins University

Louis Katz Alpert, *Professor Emeritus of Medicine*
B.S. 1928, M.D. 1932, Yale University

Harry Ford Anderson, *Professor Emeritus of Dermatology and Syphilology*
M.D. 1924, University of Cincinnati

William Staton Anderson, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1927, Duke University; M.D. 1931, Johns Hopkins University

Brian Brewer Blades, *Professor Emeritus of Surgery*
B.A. 1928, University of Kansas; M.D. 1932, Washington University

Walter Andrew Bloedorn, *Professor Emeritus of Medicine*
M.D. 1909, Creighton University; B.A. 1915, M.A. 1916, Sc.D. 1948, George Washington University

Thomas McPherson Brown, *Professor Emeritus of Medicine*
B.A. 1929, Swarthmore College; M.D. 1933, Johns Hopkins University

Dexter Means Bullard, *Professor Emeritus of Clinical Psychiatry*
Ph.B. 1920, Yale University; M.D. 1923, University of Pennsylvania

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University

Frank Duncan Costenbader, *Professor Emeritus of Clinical Ophthalmology*
B.S. 1925, Hampden-Sydney College; M.D. 1929, University of Virginia

Jeremiah Keith Cromer, *Professor Emeritus of Clinical Obstetrics and Gynecology*
M.D. 1929, B.A. 1931, George Washington University

* The Faculty and Staff of Instruction listed here and at the head of each department is for the academic year 1976-77. Faculty and staff members who hold appointments in two or more departments have the department of primary responsibility listed first.

Henry Lauran Darner, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1916, Western Maryland College; M.D. 1920, Johns Hopkins University

Paul Frederick Dickens, *Professor Emeritus of Clinical Medicine*
M.D. 1908, University of Nashville

Samuel Mayer Dodek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1923, George Washington University; M.D. 1927, Thomas Jefferson University; M.A. 1931, Case Western Reserve University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

James Albert Dusbabek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
M.D. 1934, George Washington University

Clayton Bernard Ethridge, *Professor Emeritus of Medicine*
M.D. 1933, University of Virginia

Clarence Kendall Fraser, *Professor Emeritus of Clinical Obstetrics and Gynecology*
Ph.B. 1931, College of the Holy Cross; M.D. 1935, Tufts University

James Quincy Gant, Jr., *Professor Emeritus of Clinical Dermatology*
B.A. 1930, M.S. 1931, Ohio State University; M.D. 1935, Medical College of Virginia of Virginia Commonwealth University

Robert Henry Groh, *Professor Emeritus of Clinical Neurology*
B.S. 1935, M.D. 1937, University of Pittsburgh

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Robert Sexton Higdon, *Professor Emeritus of Dermatology (In Residence)*
B.S. 1933, Millsaps College; M.D. 1937, Tulane University

Alec Horwitz, *Professor Emeritus of Clinical Surgery*
B.A. 1920, M.D. 1923, George Washington University; M.S. in Surg. 1927, University of Minnesota

Hayden Kirby-Smith, *Professor Emeritus of Clinical Dermatology*
B.S. 1927, University of the South; M.D. 1937, George Washington University

Chester Elwood Leese, *Professor Emeritus of Physiology*
B.A. 1922, M.A. 1925, Ph.D. 1930, University of Iowa

Edward Lewis, *Professor Emeritus of Clinical Pediatrics*
M.D. 1918, George Washington University

Reginald Spencer Lourie, *Professor Emeritus of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.S. 1930, Cornell University; M.D. 1936, State University of New York Downstate Medical Center; Med.Sc.D. 1941, Columbia University

Benjamin Manchester, *Clinical Professor Emeritus of Medicine*
M.D. 1935, George Washington University

Preston Alexander McLendon, *Professor Emeritus of Pediatrics*
B.S. 1913, Wake Forest University; M.D. 1915, Columbia University

Daniel Bruce Moffett, *Professor Emeritus of Otolaryngology*
B.A. 1910, University of Richmond; M.D. 1915, University of Maryland

Joseph Francis Ney, *Professor Emeritus of Clinical Medicine*
B.S. 1931, University of Virginia; M.D. 1935, Harvard University

Margaret Mary Nicholson, *Professor Emeritus of Clinical Pediatrics*
B.A. 1922, M.D. 1925, George Washington University

George Nordlinger, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1918, M.D. 1922, George Washington University

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

Lois Irene Platt, *Associate Professor Emeritus of Pathology*
B.A. 1931, Goucher College; M.D. 1946, University of Maryland

Herbert Pollack, *Professor Emeritus of Clinical Medicine (Biochemistry)*
B.A. 1925, Washington and Lee University; M.D. 1929, Cornell University; Ph.D. 1933, University of Minnesota

Andrew Gabriel Prandoni, *Professor Emeritus of Clinical Medicine*
B.S. 1934, Fordham University; M.D. 1938, State University of New York Downstate Medical Center

Lawrence Elias Putnam, *Professor Emeritus of Clinical Medicine*
B.A. 1930, M.D. 1934, Harvard University

Benjamin Rones, *Professor Emeritus of Clinical Ophthalmology*
B.A. 1922, M.D. 1926, Johns Hopkins University

Ernest Alfred Watson Sheppard, *Professor Emeritus of Clinical Ophthalmology*
M.D., C.M. 1926, Queens University, Canada

Donald Harrison Stubbs, *Professor Emeritus of Clinical Anesthesiology*
B.A. 1929, M.A. 1931, M.D. 1932, George Washington University

Ira Rockwood Telford, *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Thomas Carlton Thompson, *Professor Emeritus of Clinical Urology*
B.S. in Med., M.D. 1920, George Washington University

Janet Graeme Travell, *Professor Emeritus of Clinical Medicine*
B.A. 1922, Wellesley College; M.D. 1926, Cornell University

John Augustine Washington, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1924, Virginia Military Institute; B.S. 1926, University of Virginia; M.D. 1930, Johns Hopkins University

James Winston Watts, *Professor Emeritus of Neurological Surgery*
B.S. 1924, Virginia Military Institute; M.D. 1928, University of Virginia

Richard Wallace Wilkinson, *Professor Emeritus of Clinical Ophthalmology*
B.A. 1925, M.D. 1928, George Washington University; M.S. in Med. 1932, University of Pennsylvania

ACTIVE

Abe Samuel Abraham, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1938, Westminster College, Pennsylvania; M.D. 1950, George Washington University

Kristof Abraham, *Associate Clinical Professor of Neurology*
M.D. 1952, Budapest University

Palma Feheruari Abraham, *Assistant Clinical Professor of Radiology*
M.D. 1954, University of Budapest

Charles Barrett Abrams, *Assistant Clinical Professor of Medicine*
B.S. 1967, Bethany College; M.D. 1971, West Virginia University

Edward Gerald Abramson, *Clinical Instructor in Urology*
B.A. 1962, University of Pennsylvania; M.D. 1967, University of Virginia

Fred Paul Abramson, *Associate Professor of Pharmacology and of Pathology*
B.A. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

R. Marshall Ackerman, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1958, M.D. 1962, University of Pittsburgh

Charles Omar Ackers, *Special Lecturer in Pathology*
B.A. 1972, Augustana College

John Pletch Adams, *Professor of Orthopaedic Surgery and of Child Health and Development*
B.S. 1943, University of Missouri; M.D. 1945, Washington University

Ann Evelyn Baryshyan Adcook, *Clinical Instructor in Pathology (Laboratory Medicine)*
B.S. 1968, Marywood College

Edward Adelson, *Associate Clinical Professor of Medicine*
B.S. 1943, M.D. 1947, Tufts University

Paul Charles Adkins, *Lewis Saltz Professor of Surgery*
B.A. 1944, M.D. 1948, Johns Hopkins University

Mohan Teckchand Advani, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1955, Punjab University, India; M.B., B.S. 1960, Osmani University, India; D.P.M. 1964, Mysore University, India

Lewis Francis Affronti, *Professor of Microbiology*
B.A. 1950, M.A. 1951, State University of New York at Buffalo; Ph.D. 1958, Duke University

Sydney John Aidinis, *Assistant Professor of Anesthesiology*
M.B., B.S. 1965, Adelaide University; F.F.A.R.C.S. 1972, Royal College of Surgeons

Cosimo Ajmone-Marsan, *Associate Clinical Professor of Neurology*
M.D. 1942, University of Torino, Italy

Farooq Akbar, *Clinical Instructor in Obstetrics and Gynecology*
M.B., B.S. 1969, King Edward Medical College, Pakistan

Flavius Abiola Akerele, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1966, Boston University; M.D. 1970, George Washington University

Julio Estuardo Alarcon, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1966, University of Trujillo, Peru

Judith Nolin Albarelli, *Instructor in Radiology (Diagnostic Ultrasound)*

Chalom Albert, *Assistant Clinical Professor of Anesthesiology*
B.A. 1949, M.D. 1953, American University of Beirut

Dan George Albert, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.S. 1938, Ohio State University; M.D. 1950, State University of New York Upstate Medical Center

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

Morris Sheldon Albert, *Assistant Clinical Professor of Child Health and Development*
B.A. 1956, Harvard University; M.D. 1960, Boston University

Solomon Naphtali Albert, *Associate Clinical Professor of Anesthesiology*
B.A. 1936, M.D. 1940, American University of Beirut

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*
B.S. 1945, University of Baghdad; M.A. 1951, University of Texas; Ph.D. 1954, Louisiana State University

Stewart Leonard Aledort, *Special Lecturer in Psychiatry and Behavioral Sciences*
B.S. 1958, City University of New York, Queens College; M.S. 1960, University of Connecticut; M.D. 1964, Yeshiva University

Theodore Crandall Alford, *Associate Professor of Surgery*
B.A. 1944, Haverford College; M.D. 1947, Johns Hopkins University

Frank Duane Allan, *Professor of Anatomy*
B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University

Leonard William Allen, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, City University of New York, Brooklyn College; M.A. 1953, City University of New York, City College; Ph.D. 1958, University of Denver

Melvin Gustavus Alper, *Clinical Professor of Ophthalmology*
B.A. 1943, M.D. 1945, University of Virginia

Joel Barry Alperstein, *Clinical Instructor in Urology*
B.S. 1961, M.D. 1967, University of Maryland

Hubert Joseph Alpert, *Clinical Instructor in Medicine*
M.D. 1962, University of Illinois

Seymour Alpert, *Professor of Anesthesiology; Vice President of the University, for Development*
B.A. 1939, Columbia University; M.D. 1943, State University of New York Downstate Medical Center

Roy Peter Altman, *Associate Professor of Surgery and of Child Health and Development*
B.A. 1955, Colgate University; M.S. 1958, University of Rochester; M.D. 1961, New York Medical College

Alice Hackney Altstatt, *Associate Professor of Anesthesiology*
B.A. 1969, Bryn Mawr College; M.A. 1952, M.D. 1956, Vanderbilt University

Antonina Neri Amigable, *Assistant Professor of Medicine*
M.D. 1966, Cebu Institute of Technology, Philippines

Sirus Amiri, *Assistant Clinical Professor of Child Health and Development*
M.D. 1956, University of Tehran

Harvey Hirsch Ammerman, *Clinical Professor of Neurological Surgery*
B.S. 1939, M.D. 1943, George Washington University

Richard Gene Ammerman, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1964, Yale University; M.D. 1968, Tufts University

Arthur James Anderson, *Assistant Clinical Professor of Medicine*
M.D. 1961, George Washington University

Elizabeth Potts Anderson, *Professorial Lecturer in Biochemistry*
B.A. 1945, Sarah Lawrence College; M.S. 1947, University of Wisconsin; Ph.D. 1950, Stanford University

Frank Hughes Anderson, *Assistant Clinical Professor of Neurology*
B.A. 1966, M.D. 1970, Harvard University

James Edward Anderson, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1955, Union College, Nebraska; M.D. 1965, Loma Linda University

Kathryn Duncan Anderson, *Assistant Professor of Surgery and of Child Health and Development*
B.A. 1961, M.A. 1964, Cambridge University; M.D. 1964, Harvard University

Rebecca Jane Anderson, *Assistant Professor of Pharmacology*
B.A. 1971, Coe College; Ph.D. 1975, Georgetown University

Seth Eli Anderson, Jr., *Assistant Professor of Medicine*
B.A. 1959, Pacific Lutheran College; M.D. 1963, University of Washington

J. Robert Andrews, *Professorial Lecturer in Radiology*
Ph.B. 1928, Brown University; M.D. 1932, Case Western Reserve University; D.Sc. 1946, University of Pennsylvania

Jack William Andrews, *Special Lecturer in Radiology*

John Lawrence Angel, *Professorial Lecturer in Anatomy and in Anthropology*
B.A. 1936, Ph.D. 1942, Harvard University

Robert Maurice Anglin, *Special Lecturer in Pathology*

Tatiana Antonovych, *Professorial Lecturer in Pathology*
M.D. 1941, University of Vienna

Leonard Philip Appel, *Clinical Instructor in Medicine*
B.A. 1953, M.D. 1957, New York University

James Richard Appleton, *Assistant Clinical Professor of Surgery (Plastic Surgery)*
B.A. 1957, University of Iowa; M.D. 1961, University of Maryland

Irwin Ardam, *Assistant Clinical Professor of Medicine*
B.A. 1948, New York University; M.D. 1954, New York Medical College

John William Argent, Jr., *Special Lecturer in Health Care Sciences*

Victor Arturo Argumedo, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1966, University of San Marcos, Peru

Bryan Arling, *Assistant Professor of Medicine*
B.A. 1965, University of Minnesota; M.D. 1969, Harvard University

Mansour Farid Armaly, *Professor of Ophthalmology*
B.A. 1947, M.D. 1952, American University of Beirut; M.S. 1957, University of Iowa

Jerome Cayton Arnett, Jr., *Clinical Instructor in Health Care Sciences*
B.A. 1963, Bridgewater College; M.D. 1967, West Virginia University

Bernard Sol Arons, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1969, Oberlin College; MD. 1973, Case Western Reserve University

James Hiram Arthmann, *Special Lecturer in Radiology*

Halbert Eugene Ashworth, *Assistant Professor of Surgery*
B.A. 1956, Duke University; M.D. 1962, West Virginia University

Philip Assatourians, *Assistant Clinical Professor of Medicine*
M.D. 1964, University of Tehran

Gilbert Paul August, *Associate Professor of Child Health and Development*
B.S. 1958, City University of New York, City College; M.D. 1962, New York University

Leon Stanley August, *Assistant Research Professor of Radiology*
B.S. 1950, Ph.D. 1957, Louisiana State University; M.S. 1952, Tulane University

Gunter Josef Augustin, *Associate Clinical Professor of Radiology*
M.D. 1952, University of Heidelberg

Rosalie Meissner Auster, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1961, University of Connecticut; M.D. 1965, Boston University

Simon Leo Auster, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, Yeshiva University; M.D. 1956, New York University

Gordon Avery, *Professor of Child Health and Development*
B.A. 1953, Harvard University; M.D. 1958, Ph.D. 1959, University of Pennsylvania

Julius Axelrod, *Distinguished Professor of Science; Professorial Lecturer in Pharmacology*
B.S. 1933, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, LL.D. 1971, George Washington University; Sc.D. 1966, University of Chicago

Silas Babin, Jr., *Assistant Clinical Professor of Medicine*
M.D. 1951, Louisiana State University, New Orleans

James Michael Bacos, *Professor of Medicine*
B.S. 1948, Virginia Polytechnic Institute and State University; M.D. 1953, Duke University

Robert Emil Badwey, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1955, Franklin and Marshall College; M.D. 1959, University of Pittsburgh

Alfred Baer, *Associate Clinical Professor of Medicine*
B.A. 1942, Ohio State University; M.D. 1945, Johns Hopkins University

William Eldridge Bageant, *Assistant Clinical Professor of Anesthesiology*
M.D. 1939, George Washington University

David Whitney Bailey, *Associate Professor of Child Health and Development*
B.A. 1954, Bowdoin College; M.D., C.M. 1958, McGill University

George William Bailey, *Assistant Professor of Health Care Sciences and of Child Health and Development*
B.A. 1963, Birmingham-Southern College; M.D. 1967, University of Alabama in Birmingham

John Martyn Bailey, *Professor of Biochemistry*
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales

William Otis Bailey, Jr., *Associate Clinical Professor of Medicine*
M.D. 1940, George Washington University

George Ivan Baker, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1950, Syracuse University; M.D. 1954, State University of New York Upstate Medical Center

Roger Denio Baker, *Professorial Lecturer in Pathology*
B.A. 1924, University of Wisconsin; M.D. 1928, Harvard University

Stewart Lee Baker, Jr., *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1942, University of Maryland; M.D. 1945, George Washington University

William Prentice Baker, *Professor of Medicine*
B.S. 1949, Indiana University; M.S. 1953, Ph.D. 1955, Michigan State University; M.D. 1959, University of Michigan

Guillermo Alfredo Balfour, *Assistant Clinical Professor of Child Health and Development*
M.D. 1959, University of Buenos Aires

Giuseppe Balsamo, *Assistant Clinical Professor of Medicine*
Laurea in Medicinae Chirurgia 1952, University of Rome

Bernard Alvin Band, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1952, B.S. 1954, George Washington University; M.D. 1959, Howard University

William Landon Banfield III, *Associate Clinical Professor of Urology*
B.A. 1954, Princeton University; M.D. 1958, George Washington University

Joan Barber, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1946, Wellesley College; M.D. 1949, Cornell University

Lewellys Franklin Barker, *Assistant Clinical Professor of Medicine*
B.A. 1955, Princeton University; M.D. 1959, Johns Hopkins University

Ann Birnbaum Barnet, *Associate Professor of Neurology and of Child Health and Development*
B.A. 1951, Sarah Lawrence College; M.D. 1956, Harvard University

Ida Sue Baron-Starke, *Instructor in Psychiatry and Behavorial Sciences and in Child Health and Development*
B.S. 1968, Cornell University; M.A. 1972, Ph.D. 1976, University of Maryland

Kenneth Brian Barr, *Assistant Clinical Professor of Pathology (Laboratory Medicine)*
B.A. 1964, Adams State College

Norman Lee Barr, Jr., *Assistant Clinical Professor of Otolaryngology*
B.A. 1959, Princeton University; M.D. 1965, Georgetown University

Solomon Efrem Barr, *Associate Clinical Professor of Medicine*
B.A. 1951, M.D. 1954, George Washington University

John William Barrett, *Assistant Clinical Professor of Neurological Surgery*
M.D. 1958, George Washington University

Robert Henry Barter, *Professor of Obstetrics and Gynecology*
B.S. 1937, M.D. 1940, University of Wisconsin

Werner Franklin Barth, *Professor of Medicine*
B.A. 1956, Columbia University; M.D. 1960, Yeshiva University

Ramez Bassir, *Assistant Professor of Clinical Engineering*
M.D. 1969, Nagoya University, Japan

Constance Urciolo Battle, *Associate Professor of Child Health and Development*
B.A. 1963, Trinity College, District of Columbia; M.D 1967, George Washington University

Marianne Bayley, *Assistant Clinical Professor of Pathology (Laboratory Medicine)*
B.S. 1963, University of Vermont; M.S. 1974, University of Maryland

John Henry Bayly, *Special Lecturer in Surgery and in Child Health and Development*
B.S. 1936, Rensselaer Polytechnic Institute; M.D. 1940, Georgetown University

Lillian McLean Beard, *Clinical Instructor in Child Health and Development*
B.S. 1965, M.D. 1970, Howard University

Harry Carl Beaver, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1959, Wheaton College, Illinois; M.D. 1963, George Washington University

Rebecca Mae Styrlund Beck, *Assistant Professor of Radiology (Radiologic Technology)*
B.S. 1974, University of Minnesota

Arthur Abbe Becker, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, City University of New York, City College; M.D. 1961, University of Iowa

Kenneth Louis Becker, *Professor of Medicine*
B.A. 1952, University of Michigan; M.D. 1956, New York Medical College; Ph.D. 1963, University of Minnesota

Vijay Bans Behari, *Clinical Instructor in Health Care Sciences*
B.M., B.S. 1966, Mallana Azad Medical College, India

Samuel Michael Belinsky, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1955, University of Bridgeport; M.D. 1959, George Washington University

A. Barry Belman, *Associate Professor of Urology and of Child Health and Development*
B.A. 1960, University of Arizona; M.D. 1964, M.S. 1969, Northwestern University

Ruth Boschwitz Benedict, *Associate Clinical Professor of Medicine*
B.A. 1935, Wellesley College; M.D. 1939, New York University

Linda Anne Marshall Bennett, *Research Instructor in Psychiatry and Behavioral Sciences*
B.A. 1965, Clarion State College; M.A. 1966, Indiana University; Ph.D. 1976, American University

Luis Felipe Bentolila, *Assistant Clinical Professor of Medicine*
M.D. 1967, University of Buenos Aires

Myron Paul Berger, *Assistant Clinical Professor of Urology*
B.S. 1960, M.D. 1964, Georgetown University

Eric Charles Bergman, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1968, Duke University; M.D. 1973, University of Pennsylvania

Sanders Harris Berk, *Assistant Clinical Professor of Dermatology and of Medicine*
B.S. 1965, M.D. 1969, University of Maryland

Peter Morris Berkman, *Associate Professor of Medicine*
B.A. 1955, Harvard University; M.D. 1959, Columbia University

David Kip Berler, *Assistant Clinical Professor of Ophthalmology*
B.A. 1955, M.D. 1958, Cornell University

Cheston Milton Berlin, Jr., *Special Lecturer in Child Health and Development*
B.A. 1958, Haverford College; M.D. 1962, Harvard University

Howard Hillel Berman, *Assistant Clinical Professor of Pathology*
B.A. 1958, Duke University; M.D. 1962, Columbia University

Sidney Berman, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1928, M.D. 1932, Georgetown University

Howard Nathan Bernstein, *Assistant Clinical Professor of Ophthalmology*
B.S. 1953, Bucknell University; M.D. 1957, State University of New York Downstate Medical Center

Leon Bernstein, *Professor of Medicine*
B.S. 1939, Ph.D. 1957, University of London; L.R.C.P. 1949, Royal College of Physicians, England; M.R.C.S. 1949, Royal College of Surgeons, England

John David Berryman, *Assistant Professor of Obstetrics and Gynecology*
B.A. 1962, Swarthmore College; M.S. 1964, Case Western Reserve University; M.D. 1967, University of Virginia

Alan Berson, *Assistant Research Professor of Clinical Engineering*
B.E.E. 1950, City University of New York, City College; M.S. in Engr. 1965, George Washington University; Ph.D. 1972, Georgetown University

Christopher Theodore Bever, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1940, M.D. 1943, Harvard University

Lewis Henry Biben, *Assistant Clinical Professor of Medicine*
M.D. 1949, Hahnemann Medical College

Charles Joel Bier, *Assistant Clinical Professor of Medicine*
B.A. 1965, M.D. 1968, George Washington University

Frantisek Stanislav Bilek, *Assistant Clinical Professor of Radiology (Radiation Therapy)*
M.D. 1962, University of Charles IV, Czechoslovakia

Sanford Louis Billet, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1947, New York University; M.D. 1951, University of Cincinnati

Audrey Thayer Billett, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1957, Wheaton College; M.S.S. 1959, Smith College

Donald Gene Birdwell, *Special Lecturer in Health Care Sciences*

Peter Birk, *Associate Clinical Professor of Medicine and of Health Care Sciences*
B.A. 1955, Princeton University; M.D. 1959, Cornell University

Philip Stanley Birnbaum, *Adjunct Associate Professor of Health Care Administration; Dean for Administrative Affairs of the Medical Center*
B.S. in M.E. 1948, M.S. in M.E. 1949, Carnegie-Mellon University; B.C.E. 1954, Rensselaer Polytechnic Institute

Kathleen Bis, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1968, M.D. 1972, George Washington University

Calvin Franklin Bishop, *Clinical Professor of Pathology (Laboratory Medicine)*
B.S. 1950, Baylor University; M.D. 1953, University of Texas, Southwestern Medical School at Dallas

Barbara Onderchek Black, *Clinical Instructor in Urology*
B.A. 1962, Trinity College, District of Columbia; M.D. 1966, Georgetown University

Edward Black, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1959, Dickinson College; M.D. 1963, New York Medical College

Emilie Annabelle Black, *Clinical Instructor in Child Health and Development*
B.S. 1942, M.D. 1945, George Washington University

Brian Douglas Blackbourne, *Associate Clinical Professor of Pathology (Forensic)*
M.D. 1962, University of Alberta

Glenn Koonce Blackburn, Jr., *Instructor in Child Health and Development*
B.S. 1965, Western Kentucky University; M.D. 1971, University of Louisville

Jeffrey David Blake, *Clinical Instructor in Child Health and Development*
B.A. 1967, Cornell University; M.M.S. 1969, Rutgers University; M.D. 1971, City University of New York, Mt. Sinai Medical School

Ethel Joan Blanchette-Mackie, *Associate Professorial Lecturer in Anatomy*
B.S. 1956, City University of New York, Queens College; M.S. 1959, New York University; Ph.D. 1965, Columbia University

Ronald Ray Blanck, *Associate Professorial Lecturer in Medicine*
D.O. 1967, Philadelphia College of Osteopathic Medicine

Vay John Blazina, *Assistant Clinical Professor of Neurology*
B.A. 1963, University of Washington; M.D. 1967, George Washington University

Dick Edward Blessing, *Special Lecturer in Pathology*

David Alan Block, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1968, Brandeis University; M.D. 1972, Johns Hopkins University

Ralph Blumhardt, *Assistant Clinical Professor of Radiology*
M.D. 1963, Hahnemann Medical College

Robert Joel Bobys, *Clinical Instructor in Otolaryngology*
M.D. 1963, Georgetown University

Conwell Edward Boccia, *Special Lecturer in Radiology*

George Pierce Bogumill, *Adjunct Associate Professor of Orthopaedic Surgery*
B.S. 1952, M.S. 1954, Ph.D. 1955, M.D. 1959, University of Wisconsin

Lawrence David Bohan, *Assistant Professor of Medicine*
B.A. 1958, Boston College; M.D. 1962, Tufts University

Norman Kay Bohrer, *Clinical Instructor in Medicine*
M.D. 1957, George Washington University

Rollon Oscar Bondelid, *Associate Research Professor of Radiology*
B.S. 1945, University of North Dakota; M.S. 1948, Ph.D. 1950, Washington University

Harold Eugene Bondy, *Clinical Instructor in Urology*
B.S. 1965, Fairmont State College; M.D. 1969, West Virginia University

Sylvester Courtney Booker, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1960, M.D. 1964, Howard University

John Andrew Bottiglione, *Special Lecturer in Child Health and Development*
B.S. 1958, University of Notre Dame; M.D. 1962, Seton Hall University

John Henry Bouma, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1948, B.S. 1949, M.B. 1952, M.D. 1953, University of Minnesota

Isabella Blanche Bourne, *Associate Clinical Professor of Child Health and Development*
B.S. 1937, Morgan State College; M.D. 1941, Howard University

Maxwell Boverman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1938, University of California, Berkeley; M.D. 1942, University of California, San Francisco

Lawrence Thompson Bowles, *Professor of Surgery; Dean for Academic Affairs of the Medical Center*
B.A. 1953, M.D. 1957, Duke University; M.S. 1964, Ph.D. 1971, New York University

Eileen Walkavich Bradley, *Associate Research Professor of Radiology (Radiobiology)*
B.A. 1966, Anna Maria College for Women; M.S. 1968, Sc.D. 1971, Harvard University

Mark Edmund Bradley, *Associate Research Professor of Radiology*
B.Sc. 1958, University of Notre Dame, M.D. 1962, University of Maryland; M.S. 1969, University of Pennsylvania; M.P.H. 1971, Harvard University

Richard Dale Bradley, *Assistant Clinical Professor of Pathology*
B.S. 1969, M.D. 1971, University of Illinois

David Ronald Brallier, *Assistant Professor of Radiology and of Child Health and Development*
B.S. 1964, University of Minnesota; M.D. 1968, University of Iowa

Julia Brandes, *Assistant Clinical Professor of Medicine*
B.A. 1961, Columbia University; M.D. 1965, New York University

Carl David Brandt, *Associate Professor of Child Health and Development (Microbiology)*
B.S. 1949, University of Connecticut; M.S. 1951, University of Massachusetts; Ph.D. 1958, Harvard University

Frederick Bertram Brandt, *Assistant Clinical Professor of Surgery*
B.S. 1942, M.D. 1943, University of Maryland

Martin Braun III, *Assistant Professor of Dermatology and of Medicine*
M.D. 1970, University of Maryland

M. Eduardo Bravo, *Clinical Instructor in Child Health and Development*
B.S., M.D. 1966, Peruvian University

David Latimer Breckbill, *Associate Professor of Radiology and of Child Health and Development*
B.S. 1960, Westmar College; M.D. 1964, University of Kansas

Gloria Godbey Brennan, *Associate Clinical Professor of Pathology*
B.A. 1949, M.D. 1952, George Washington University

Alexander Breslow, *Professor of Pathology*
B.S. 1948, M.S., M.D. 1953, University of Chicago

Ellen Gundersheim Briefel, *Adjunct Assistant Professor of Radiology (Radiation Physics)*
B.S. 1967, University of Rochester; M.S. 1969, Yale University; M.D. 1976, Brandeis University

William Herndon Brigge, *Special Lecturer in Health Care Sciences*

Albert Seymour Bright, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1935, M.D. 1938, George Washington University

Milton Wilfred Brightman, *Professorial Lecturer in Anatomy*
B.S. 1945, M.A. 1948, University of Toronto; Ph.D. 1954, Yale University

Warren Daniel Brill, *Associate Clinical Professor of Medicine*
B.S., M.D. 1944, University of Maryland

Raymond Curtis Bristol, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Stanford University; M.D. 1962, University of Southern California

Michael Brody, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1962, New York University; M.D. 1966, New York Medical College

Nancy Carol Brogdon, *Special Lecturer in Pathology (Allied Health Sciences)*
B.A. 1969, University of California, Davis

Bertram Brown, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, City University of New York, Brooklyn College; M.D. 1956, Cornell University; M.P.H. 1960, Harvard University

Brooks Gideon Brown III, *Clinical Instructor in Ophthalmology*
B.A. 1965, Washington and Lee University; M.D. 1969, George Washington University

Crawford Southwell Brown, *Associate Clinical Professor of Dermatology*
B.A. 1946, Kenyon College; M.D. 1948, University of Michigan

Blackwell Smith Bruner, *Clinical Instructor in Ophthalmology and in Child Health and Development*
M.D. 1963, George Washington University

Philip Craig Brunschwyler, *Associate Clinical Professor of Child Health and Development*
B.A. 1951, West Virginia University; M.D. 1955, University of Maryland

Robert Wesley Bryant, Jr., *Assistant Research Professor of Biochemistry*
B.S. 1966, State University of New York, College of Environmental Science and Forestry; Ph.D. 1973, Florida State University

Charles Walter Buchan, *Special Lecturer in Health Care Sciences*

Darrell Shirley Buchanan, *Clinical Professor of Neurology*
B.S. 1954, Baylor University; M.D. 1957, University of Arkansas

Daniel Budd, *Assistant Professor of Surgery*
B.A. 1965, Rutgers—The State University; M.D. 1969, Duke University

Verlin Dalbert Buechler, *Special Lecturer in Health Care Sciences*

Gregory James Buffone, *Instructor in Child Health and Development*
B.S. 1971, Jacksonville University; M.S. 1973, University of South Florida; Ph.D. 1975, University of North Carolina

James Carroll Bulger, *Assistant Professorial Lecturer in Obstetrics and Gynecology*
B.S. 1950, D.D.S. 1955, M.D. 1961, University of Maryland

James Matthew Burgin, *Assistant Clinical Professor of Child Health and Development*
B.A. 1962, Haverford College; M.D. 1966, Columbia University

Lois Burnhill, *Special Lecturer in Obstetrics and Gynecology*
B.A. 1955, City University of New York, Queens College

Michael Seth Burnhill, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1949, Syracuse University; M.D. 1953, University of Vermont; D.M.S. 1971, State University of New York Downstate Medical Center

William Wesley Burr, Jr., *Professorial Lecturer in Biochemistry (Isotopes)*
B.A. 1947, University of Nebraska; M.S. 1948, Ph.D. 1951, University of Illinois; M.D. 1960, University of Texas Southwestern Medical School at Dallas

Boyd Lee Burris, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1951, M.D. 1952, University of Tennessee

James Burwell, *Associate Clinical Professor of Radiology*
B.A. 1952, University of Pittsburgh; M.D. 1956, University of Maryland

Stewart William Bush, *Associate Clinical Professor of Medicine*
B.S. 1943, University of Massachusetts; M.D. 1946, Johns Hopkins University

Robert Neil Butler, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1949, M.D. 1953, Columbia University

Edward Bernard Byrd, *Clinical Instructor in Neurological Surgery*
B.A. 1963, M.D. 1965, George Washington University

Richard Anderson Cahill, *Assistant Professor of Child Health and Development*
B.S. 1963, M.D. 1967, St. Louis University

Juan Bautista Calatayud, *Associate Clinical Professor of Medicine*
M.D. 1952, University of Valencia, Spain

Thomas Ralph Callihan, *Adjunct Instructor in Pathology*
B.A. 1969, Kenyon College; M.D. 1973, George Washington University

Ronald Ross Cameron, *Assistant Clinical Professor of Surgery*
B.A. 1953, Johns Hopkins University; M.D. 1957, University of Maryland

Carlena Lee Campbell, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1955, West Virginia University; M.D. 1957, Medical College of Virginia of Virginia Commonwealth University

Jerome Wolf Canter, *Assistant Clinical Professor of Surgery*
M.D. 1955, George Washington University

Johnie Carlisle, Jr., *Special Lecturer in Health Care Sciences*

David Roland Carlson, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1953, Drake University; M.D. 1960, George Washington University

Russell Wayne Carlson, *Special Lecturer in Radiology*

David Orlo Carpenter, *Professorial Lecturer in Physiology*
B.A. 1959, M.D. 1964, Harvard University

Noel Austen Carr, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1962, M.D. 1968, Howard University

Robert Francis Carretta, *Assistant Clinical Professor of Radiology*
B.S. 1962, Pennsylvania State University; M.D. 1966, Creighton University

Charles Patrick Henry Carroll, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1952, Boston College; M.D. 1961, Georgetown University

David Thornhill Casey, *Clinical Instructor in Ophthalmology*
B.S. 1960, University of Pittsburgh; M.D. 1964, Hahnemann Medical College

Harold Wilton Casey, *Clinical Professor of Pathology (Comparative Pathology)*
B.S. 1954, D.V.M. 1957, University of Missouri; M.P.H. 1958, Tulane University; Ph.D. 1965, University of California, Davis

Marie Mullaney Cassidy, *Professor of Physiology*
B.S. (General) 1957, B.S. (Special) 1958, M.S. 1959, Ph.D. 1962, National University of Ireland

Antoinette Castagnolo, *Instructor in Radiology (Allied Health)*

Donald Castell, *Professor of Medicine*
B.A. 1958, M.D. 1960, George Washington University

Rosella Decena Castro, *Instructor in Child Health and Development*
B.A. 1959, Philippine Union College; M.D. 1964, Manila Central University

Hereward Seagrieve Cattell, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1954, Amherst College; M.D. 1958, University of Rochester

William Paxson Chalfant, Jr., *Assistant Clinical Professor of Ophthalmology*
M.D. 1934, Hahnemann Medical College

Morris Jay Chalick, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

John Loomis Chamberlain III, *Associate Clinical Professor of Child Health and Development*
B.S. 1953, Amherst College; M.D. 1957, University of Virginia

Chao Hung Chan, *Assistant Professor of Medicine*
B.B.A. 1955, M.D. 1962, University of the East, Philippines

James Chiu Ming Chan, *Associate Professor of Child Health and Development*
M.D. 1964, McGill University

Roma Sakhuja Chandra, *Associate Professor of Pathology and of Child Health and Development*
M.B., B.S. 1958, Lady Hardinge Medical College, India

Philippe Ernest Chanel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1970, University of Lausanne, Switzerland

Paul P.L. Chang, *Assistant Clinical Professor of Medicine*
M.D. 1959, National Taiwan University; M.P.H. 1976, Johns Hopkins University

Robert Merritt Chanock, *Professor of Child Health and Development*
B.S. 1945, M.D. 1947, University of Chicago

George Allyn Chapman, *Assistant Clinical Professor of Medicine*
B.S. 1942, College of William and Mary; M.D. 1945, Medical College of Virginia of Virginia Commonwealth University

Jack Dowman Chapman II, *Special Lecturer in Health Care Sciences*

David Charney, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1964, City University of New York, Brooklyn College; M.D. 1968, State University of New York Upstate Medical Center

Kenneth Herbert Chase, *Assistant Professor of Medicine*
B.A. 1964, M.D. 1968, University of California, Los Angeles

Jacob Bernard Chassan, *Special Lecturer in Psychiatry and Behavioral Sciences (Biostatistics)*
B.S. 1939, City University of New York, City College; M.A. 1949, Ph.D. 1958, George Washington University

C. Terrence Chastek, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1973, State University of New York Upstate Medical Center

John Charles Chatel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1961, George Washington University; M.D. 1965, Creighton University

Irene Minna Chatoor-Koch, *Clinical Instructor in Psychiatry and Behavioral Sciences and in Child Health and Development*
M.D. 1965, Heidelberg University, Germany

Tsung O. Cheng, *Professor of Medicine*
B.S. 1947, M.D. 1950, St. John's University, China; M.S. 1956, University of Pennsylvania

Viola Wai Chiu Cheng, *Assistant Professor of Child Health and Development*
M.D. 1961, National Taiwan University

Vincent Victor Cherico, *Instructor in Radiology (Nuclear Medicine)*

Ronald August Chez, *Professor of Obstetrics and Gynecology*
B.A. 1953, Johns Hopkins University; M.D. 1957, Cornell University

William Robert Chiarulli, *Special Lecturer in Health Care Sciences*

Betty Jane Lofton Chiota, *Clinical Instructor in Obstetrics and Gynecology (Nurse Midwifery)*
B.S.N. 1956, M.S.N. 1974, Catholic University of America

Cecilin Chisholm, *Clinical Instructor in Child Health and Development*
B.S. 1963, M.D. 1967, Howard University

Wu Shung Chiu, *Associate Professor of Medicine*
M.D. 1959, National Taiwan University

Diane Camille Tate Choate, *Instructor in Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1968, M.S.W. 1970, University of Oklahoma

Paul Chodoff, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1934, University of Pennsylvania; M.D. 1938, Thomas Jefferson University

Byung-Il Choi, *Clinical Instructor in Medicine*
M.D. 1965, Severance Medical College, Korea

Joginder Gurbux Chopra, *Assistant Clinical Professor of Child Health and Development*
M.D. 1954, Bombay University; M.S., M.P.H. 1961, Columbia University

Nicholas Louis Christopher, *Associate Clinical Professor of Medicine*
B.A. 1959, M.D. 1963, University of Michigan

Yang-Ming Chu, *Associate Research Professor of Microbiology*
B.S. 1959, University of Washington; M.S. 1964, Ph.D. 1967, George Washington University

Domingo Chua, *Clinical Instructor in Health Care Sciences*
M.D. 1962, University of Santo Tomas, Manila

Che-Yen Chuang, *Visiting Associate Professor of Medicine*
M.B. 1956, National Taiwan University; M.D. 1971, Kobe University, Japan

Francis Chucker, *Assistant Clinical Professor of Medicine*
M.D. 1957, Marquette University

Lloyd Eugene Church, *Associate Professorial Lecturer in Surgery (Oral Surgery)*
B.A. 1942, West Virginia University; D.D.S. 1944, University of Maryland; M.S. 1951, Ph.D. 1959, George Washington University

Judith Ann Fingert Chused, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Wellesley College; M.D. 1967, Harvard University

Vichitur Chusuei, *Clinical Instructor in Child Health and Development*
M.D. 1962, Chulalongkorn University, Thailand

Donna Sharpe Chuzi, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1967, Columbia University

Attila Sakir Cigtay, *Assistant Clinical Professor of Radiology*
M.D. 1956, Istanbul University

Dianne Cresswell Cinnamon, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1968, Muskingum College; MD. 1973, George Washington University

Richard Francis Cioffi, *Assistant Clinical Professor of Medicine*
B.A. 1962, College of the Holy Cross; M.D. 1966, College of Medicine and Dentistry of New Jersey

Roy Robert Cioletti, *Clinical Instructor in Child Health and Development*
B.A. 1966, Brown University; M.D. 1970, College of Medicine and Dentistry of New Jersey

Charles Michael Citrin, *Assistant Clinical Professor of Radiology*
B.A. 1966, Indiana University; M.D. 1970, State University of New York Downstate Medical Center

Margaret Mary Clancy, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.S. 1969, Fordham University; M.D. 1973, Georgetown University

Ross James Clark, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1949, M.D. 1956, Howard University; M.S. 1951, University of New Hampshire

James McClay Close, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1951, Virginia Military Institute; M.D. 1955, University of Maryland

Charles Seymour Coakley, *Professor of Anesthesiology*
M.D. 1937, George Washington University

Orr McClentic Cobb, Jr., *Assistant Professor of Medicine*
B.S. 1966, Newberry College; M.D. 1970, Medical University of South Carolina

Gloria Grimes Cochran, *Associate Professor of Child Health and Development*
B.S. 1945, M.D. 1949, Duke University

Robert Carter Cochran, *Assistant Professor of Surgery*
B.A. 1955, Princeton University; M.D. 1960, Boston University

Joseph Henry Coenen, *Special Lecturer in Radiology*

George Joel Cohen, *Associate Professor of Child Health and Development*
M.D. 1950, George Washington University

Martin Herbert Cohen, *Assistant Professor of Medicine*
B.S. 1960, City University of New York, Queens College; M.D. 1964, New York University

Philip Cohen, *Assistant Professor of Medicine*
B.A. 1966, Columbia University; M.D. 1970, Harvard University

Victor Hugo Cohn, Jr., *Professor of Pharmacology*
B.S. 1952, Lehigh University; M.A. 1954, Harvard University; Ph.D. 1961, George Washington University

Albert Presby Colburn, *Special Lecturer in Health Care Sciences*

Allan Bertram Coleman, *Clinical Professor of Child Health and Development*
M.D. 1943, George Washington University

Raymond Hugh Coleman, *Clinical Instructor in Child Health and Development*
B.S. 1969, M.D. 1973, Tufts University

Roy Melvin Coleman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, Harvard University; M.D. 1959, University of Rochester

Richard Conant, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1959, Rutgers—The State University; M.D. 1963, State University of New York Upstate Medical Center

Ridgely Glenn Conant, *Special Lecturer in Radiology*

Nathaniel Thomas Connally, *Clinical Instructor in Health Care Sciences and in Medicine*
B.A. 1958, M.D. 1962, University of Virginia

Thomas Martin Connor, *Assistant Clinical Professor of Child Health and Development*
B.S. 1961, St. Francis College; M.D. 1966, University of Bologna, Italy

Louis Robert Conte, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1961, Johns Hopkins University

Charles Barrie Cook, *Clinical Professor of Pathology*
B.S. 1945, Hampden-Sydney College; M.D. 1948, George Washington University

Thomas Alfred Cook, Jr., *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1949, University of Virginia

Stewart Dallas Cooley, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1957, Ohio State University; M.D. 1961, University of Cincinnati

Francis Donald Cooney, *Assistant Clinical Professor of Neurological Surgery*
B.S. 1959, King's College, Pennsylvania; M.D. 1963, University of Pittsburgh

James Kyle Cooper, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1958, University of Kentucky; M.D. 1962, Vanderbilt University

Wayne Douglas Cooper, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1969, Alfred University; M.D. 1973, George Washington University

William Hurlbert Cooper, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1946, Case Western Reserve University; M.D. 1949, George Washington University

Francis Henry Corcoran, *Assistant Professor of Medicine*
M.D. 1962, St. Louis University

Paul Joseph Corso, *Assistant Professor of Surgery and of Anesthesiology*
B.A. 1966, M.D. 1969, George Washington University

Erminio Costa, *Professorial Lecturer in Pharmacology*
M.D. 1947, University of Cagliari, Italy

Ronald Michael Costell, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, M.A. 1967, M.D. 1967, Stanford University

Elaine Wolf Cotlove, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1942, Columbia University; M.D. 1944, New York University

Gertrude Cotts, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1935, Friedrich Wilhelm University, Germany

Laurence Ari Cove, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1955, Columbia University; M.D. 1959, State University of New York Downstate Medical Center

Lewis Alvin Coveler, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.A. 1966, New York University; M.D. 1970, University of Pittsburgh

Daniel David Cowell, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1956, University of Pennsylvania; M.D. 1960, Seton Hall University

Joel Reed Crabbe, *Clinical Instructor in Pathology*
B.S. 1968, M.S. 1971, Texas A&M University

Eugene Fulton Crabtree, *Special Lecturer in Health Care Sciences*

John Brown Craft, Jr., *Associate Professor of Anesthesiology and of Obstetrics and Gynecology*
B.A. 1959, Johns Hopkins University; M.D. 1963, Georgetown University

Louis Aleck Craig, Jr., *Assistant Clinical Professor of Medicine*
B.A. 1939, Georgetown University; M.D. 1943, Johns Hopkins University

Thomas Craig, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, College of the Holy Cross; M.D. 1963, State University of New York Downstate Medical Center; M.P.H. 1967, Johns Hopkins University

Adelbert DeVere Cramer, *Associate Clinical Professor of Pathology (Blood Banking)*
B.S. in Ed. 1950, B.A. 1956, M.D. 1960, University of Kansas

Virginia Lou Crandall, *Clinical Instructor in Obstetrics and Gynecology*
B.S.N. 1969, Washington University; M.S.N. 1971, Catholic University of America

Neil Allan Crane, *Clinical Instructor in Medicine*
B.S.E. 1961, Princeton University; M.D. 1965, Washington University

Elizabeth Amanda Crisp, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1943, Texas Woman's University; M.D. 1950, Louisiana State University, New Orleans

Stanley Gramch Crossland, *Assistant Clinical Professor of Surgery*
B.S. 1967, University of Richmond; M.D. 1971, George Washington University

Jack Crowell, *Assistant Clinical Professor of Medicine*
B.S. 1947, M.D. 1951, George Washington University

Brian Crowley, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1957, Yale University

David Michael Cryan, *Assistant Clinical Professor of Dermatology*
B.S. 1957, Loyola University of Los Angeles; M.D. 1961, University of California, Los Angeles

James Eugene Crytzer, *Special Lecturer in Pathology*

Leon Richard Culbertson, *Professor of Urology*
B.S., M.D. 1936, University of Virginia

Cecil Carleton Helmer Cullander, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1944, M.D. 1946, University of Wisconsin

Edward Earl Cunningham, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1952, Washington and Jefferson College; M.S. 1954, Duquesne University; M.D. 1960, George Washington University

James Allen Curtin, *Professor of Medicine*
B.A. 1946, Canisius College; M.D. 1950, State University of New York at Buffalo

Leon Cytryn, *Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
M.D. 1951, University of Marburg

Carol Lynne Czerwinski, *Clinical Instructor in Pathology (Laboratory Medicine)*
B.S. 1968, M.S. 1970, Marquette University; Ph.D. 1973, Georgetown University

Angelo D'Agostino, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1945, St. Michael's College; M.D. 1949, M.S. 1953, Tufts University

Gordon Walford Daisley, Jr., *Clinical Instructor in Child Health and Development*
B.A. 1946, Dartmouth College; M.D. 1948, George Washington University

Abraham Wolffe Danish, *Associate Clinical Professor of Medicine*
B.A. 1938, M.D. 1941, George Washington University

Stuart Henry Danovitch, *Associate Clinical Professor of Medicine*
B.A. 1957, Harvard University; M.D. 1960, Northwestern University

Daniel Albert Dansak, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1966, Drexel University; M.D. 1970, Georgetown University

Michael William Datch, *Clinical Instructor in Child Health and Development*
B.A. 1962, Washington and Jefferson College; M.D. 1966, George Washington University

Donald William Datlow, *Clinical Instructor in Medicine*
B.S. 1952, M.S. 1954, George Washington University; M.D. 1960, University of Maryland

William Davidson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1947, M.S. 1948, M.D. 1953, Duke University

David Oliver Davis, *Professor of Radiology and of Neurology*
B.S. 1954, University of Illinois; M.D. 1958, St. Louis University

Donald Alan Davis, *Assistant Research Professor of Child Health and Development and Assistant Professorial Lecturer in Anatomy*
B.A. 1963, Pepperdine University; Ph.D. 1969, Vanderbilt University

Donald Irvin Davis, *Assistant Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Harvard University; M.D. 1968, University of Pennsylvania

Miryam Maltinskis Davis, *Assistant Clinical Professor of Neurology and of Child Health and Development*
M.D. 1957, University of Buenos Aires

Adrian Wallen Davison, *Special Lecturer in Pathology*
B.A. 1973, Boston University

David Davoudlarian, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1959, Faculté Française de Médecine, Lebanon

Robert Day, *Assistant Clinical Professor of Ophthalmology*
B.A. 1936, Harvard University; M.D. 1943, Johns Hopkins University

Robert Neal DeAngelis, *Clinical Instructor in Dermatology*
M.D. 1968, Medical College of Virginia of Virginia Commonwealth University

Rosalie Frances De Giovanni-Donnelly, *Assistant Research Professor of Microbiology*
B.A. 1947, M.A. 1953, City University of New York, Brooklyn College; Ph.D. 1961, Columbia University

Ronald Stuart Deitch, *Clinical Instructor in Ophthalmology*
B.A. 1954, Washington and Lee University; M.D. 1958, George Washington University

Anatole Stephen Dekaban, *Associate Clinical Professor of Neurology*
M.D. 1939, Warsaw University; M.S. 1951, Ph.D. 1954, McGill University

Donald William Delaney, *Professor of Child Health and Development*
B.S. 1949, St. Michael's College; M.D. 1954, Georgetown University

Donald Edward Deliz, Sr., *Special Lecturer in Health Care Sciences*

Nancy Baker Delston, *Adjunct Instructor in Psychiatry and Behavioral Sciences*
B.A. 1972, George Washington University; M.S.W. 1973, Catholic University of America

Armando Antonio de Moya, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1960, Wake Forest University

William Charles Dempsey, *Associate Professor of Surgery (Plastic Surgery)*
B.S. 1951, St. John's University, New York; M.D. 1955, State University of New York Downstate Medical Center

Elma Sitomer Denham, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1947, University of Wisconsin; M.S.W. 1952, University of Pennsylvania

Michael William Dennis, *Clinical Instructor in Neurological Surgery*
B.A. 1965, Brown University; M.D. 1969, Yale University

Shekhar Rajeshwar Deshmukh, *Assistant Professor of Anesthesiology*
M.B., B.S. 1966, Nagpur Medical College, India; D.A. 1969, Royal College of Surgeons, London; F.F.A.R.C.S.I. 1972, Royal College of Surgeons, Ireland

Raylene Ann De Vine-Curcio, *Clinical Instructor in Child Health and Development*
M.D. 1968, Howard University

Vincent Theodore DeVita, *Professor of Medicine*
B.S. 1957, College of William and Mary; M.D. 1961, George Washington University

James Alan Deye, *Associate Professor of Radiology (Radiation Physics)*
B.A. 1965, Thomas More College; M.S. 1969, Ph.D. 1970, Vanderbilt University

Herbert Harold Diamond, *Clinical Instructor in Child Health and Development*
M.D. 1936, George Washington University

Maria Joaquina Diaz, *Special Lecturer in Pathology*
B.S. 1967, American University

Giovanni Di Chiro, *Clinical Professor of Neurological Surgery*
M.D. 1949, University of Naples

Jesus Villanueva Dichoso, *Clinical Instructor in Health Care Sciences*
M.D. 1970, Far Eastern University, Philippines

Robert Paul Dickey, *Clinical Instructor in Child Health and Development*
B.S. 1961, University of Minnesota Technical Institute; M.S. 1962, Massachusetts Institute of Technology; M.D. 1970, University of Minnesota

Kenneth James Dickie, *Assistant Clinical Professor of Medicine*
M.D. 1963, University of Toronto

Joseph San Miguel Dimapilis, *Special Lecturer in Health Care Sciences*

David Francis Dinges, *Research Instructor in Child Health and Development*
B.A. 1971, Benedictine College; M.S. 1974, Ph.D. 1976, St. Louis University

Joseph Amedeo Di Paolo, *Associate Professorial Lecturer in Anatomy*
B.A. 1948, Wesleyan University; M.S. 1949, Case Western Reserve University; Ph.D. 1951, Northwestern University

Edward John Distelhorst, Jr., *Assistant Professor of Anesthesiology and of Child Health and Development*
B.S. 1964, University of Iowa; M.D. 1969, University of Missouri

Larry Dizmang, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, University of California, Berkeley; M.D. 1961, University of California, San Francisco

William Octavius Dobbins III, *Professor of Medicine*
M.D. 1957, University of Alabama in Birmingham

William Henry Dobbs, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.S. 1949, M.D. 1952, Emory University

Andrew Ivo Dobranski, *Assistant Clinical Professor of Orthopaedic Surgery*
M.D. 1954, Medical Academy of Warsaw

Oscar Irving Dodek, Jr., *Clinical Professor of Obstetrics and Gynecology*
B.A. 1956, University of Michigan; M.D. 1956, George Washington University

Herenia Isabel Osma Doerr, *Clinical Instructor in Pathology (Laboratory Medicine)*
B.S. 1953, Indiana University

Karl Maximilian Doetsch, *Special Lecturer in Pathology*
B.S. 1966, University of Richmond; M.P.H. 1970, University of North Carolina; M.S. 1974, Medical University of South Carolina

Howard Alexander Donald, *Clinical Professor of Obstetrics and Gynecology*
M.D. 1939, George Washington University

John Culver Donaldson, *Assistant Professor of Medicine*
B.A. 1965, California State University, San Diego; M.D. 1969, University of Pennsylvania

Molla Sloane Donaldson, *Research Instructor in Health Care Sciences*
B.A. 1966, Wellesley College; M.S. 1970, University of Virginia

Orville Wright Donnelly, *Associate Clinical Professor of Medicine*
B.A. 1943, Swarthmore College; M.S. 1951, M.D. 1957, George Washington University

Mark Donowitz, *Assistant Clinical Professor of Medicine*
B.A. 1964, Brandeis University; M.D. 1968, Johns Hopkins University

John Leo Doppman, *Clinical Professor of Radiology*
B.A. 1949, College of the Holy Cross; M.D. 1953, Yale University

Paul Austin Dorn, Jr., *Clinical Instructor in Ophthalmology*
B.A. 1953, St. Anselm's College; M.D. 1965, Georgetown University

Robert LeRoy Dow, *Associate Clinical Professor of Orthopaedic Surgery*
B.A. 1944, M.D. 1948, Cornell University

Spyros Doxiadis, *Visiting Professor of Child Health and Development*
M.B. 1940, M.D. 1943, University of Athens

Brian Bowles Doyle, *Assistant Professor of Psychiatry and Behavioral Sciences and of Health Care Sciences*
B.A. 1962, Harvard University; M.D., C.M. 1966, McGill University

Bruce Alan Drum, *Assistant Research Professor of Ophthalmology*
B.S. 1969, Ph.D. 1973, Ohio State University

George Dudas, *Assistant Clinical Professor of Urology*
M.D. 1952, University of Budapest

Michael Jean Duea, *Clinical Instructor in Radiology*

Virginia Duggins, *Assistant Clinical Professor of Neurology*
B.A. 1942, Sweet Briar College; M.A. 1951, M.D. 1955, George Washington University

Burdett Sheridan Dunbar, *Associate Professor of Anesthesiology and of Child Health and Development*
B.S. 1960, M.D. 1963, University of Illinois

Rosalie Ann Dunn, *Associate Research Professor of Clinical Engineering*
B.A. 1962, M.A. 1965, Ph.D. 1967, Catholic University of America

Robert DuPont, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Emory University; M.D. 1963, Harvard University

Robert Edward duPrey, *Assistant Clinical Professor of Ophthalmology*
B.S. 1942, Trinity College, Connecticut; M.D. 1945, Thomas Jefferson University

Jack Durell, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1949, Harvard University; M.D. 1953, Yale University

Thomas Patrick Dwyer, *Assistant Clinical Professor of Medicine*
B.S. 1954, Boston College; M.D. 1958, Tufts University

Robert Francis Dyer, *Assistant Clinical Professor of Medicine*
B.A. 1951, University of Michigan; M.D. 1955, George Washington University

Anne Elizabeth Eager, *Clinical Instructor in Ophthalmology*
M.D. 1967, Georgetown University

Lawrence Joseph Eanet, *Assistant Clinical Professor of Dermatology*
B.A. 1952, Harvard University; M.D. 1956, George Washington University

Kenneth Martin Earle, *Professorial Lecturer in Neurological Surgery*
B.A. 1942, Rice University; M.D. 1945, University of Texas Medical Branch at Galveston; M.S. 1951, McGill University

Calvin Buddy Early, *Associate Professor of Neurological Surgery*
B.S. 1952, U.S. Coast Guard Academy; B.A. 1957, M.D. 1960, Ph.D. 1967, Ohio State University

Don Elias Easterbrooks III, *Special Lecturer in Radiology (Radiologic Technology)*

William Charles Eckelman, *Associate Professor of Radiology*
B.S. 1963, St. Louis University; M.A. 1966, Ph.D. 1968, Washington University

Henry Dunlop Ecker, *Associate Clinical Professor of Medicine*
B.S. 1936, M.D. 1940, University of Virginia

George Themistocles Economos, *Assistant Clinical Professor of Medicine*
M.D. 1949, University of Athens; M.D. 1954, University of Vermont

Richard Nathan Edelson, *Assistant Clinical Professor of Neurology*
B.A. 1963, Dartmouth College; M.D. 1966, Harvard University

David Eden, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1938, Cornell University; M.D. 1943, New York University

Mitchell Edson, *Associate Professor of Urology*
B.S. 1949, U.S. Merchant Marine Academy; M.A. 1952, Columbia University; M.D. 1956, Yale University

Gordon Stuart Edwards, *Assistant Professor of Pharmacology*
B.A. 1959, Amherst College; M.A. 1962, Harvard University; Sc.D. 1970, Massachusetts Institute of Technology

Maureen Crittenden Edwards, *Assistant Professor of Child Health and Development*
B.S. 1966, Marquette University; M.D. 1970, George Washington University

Bernard Ehrlich, *Clinical Instructor in Ophthalmology*
B.S. 1952, M.B., B.Surg. 1956, Durham University

Leonard D. Ehrlich, *Clinical Instructor in Health Care Sciences*
B.A. 1968, City University of New York, Hunter College; M.D. 1972, George Washington University

Wilfred Russell Ehrmantraut, *Assistant Clinical Professor of Medicine*
B.S. 1948, University of Maryland; M.D. 1952, George Washington University

Daniel Ein, *Associate Clinical Professor of Medicine*
B.A. 1959, Columbia University; M.D. 1964, Yeshiva University

Sanford Harold Eisenberg, *Assistant Clinical Professor of Orthopaedic Surgery*
M.D. 1942, State University of New York Downstate Medical Center

Rona Copen Eisner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Smith College; Ph.D. 1967, New York University

Mervyn Elgart, *Professor of Dermatology, of Child Health and Development, and of Medicine*
B.A. 1953, City University of New York, Brooklyn College; M.D. 1957, Cornell University

Gary Wayne Elliot, *Special Lecturer in Radiology*

George Avery Ellsworth, *Assistant Clinical Professor of Health Care Sciences and of Psychiatry and Behavioral Sciences*
B.A. 1965, Kansas State University; M.D. 1968, Harvard University

March Enders, *Assistant Clinical Professor of Medicine*
B.A. 1951, Oberlin College; M.D. 1960, Yale University

Gloria Donna Eng, *Professor of Child Health and Development and of Medicine*
M.D. 1955, Marquette University

Milton Engel, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1956, Harvard University; M.D. 1960, Yeshiva University

William King Engel, *Clinical Professor of Neurology*
B.A. 1951, Johns Hopkins University; M.D. 1955, McGill University

Joseph Martin English III, *Special Lecturer in Child Health and Development*
B.S. 1964, M.D. 1968, Georgetown University

William Francis Enos, *Associate Clinical Professor of Pathology*
B.A. 1942, Dartmouth College; M.D. 1945, State University of New York Downstate Medical Center

Burton Seymour Epstein, *Professor of Anesthesiology and of Child Health and Development*
B.A. 1954, M.D. 1957, George Washington University

Julius Robert Epstein, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1937, George Washington University

Stephen Epstein, *Assistant Clinical Professor of Otolaryngology*
B.A. 1960, New York University; M.D. 1964, University of Health Sciences/Chicago Medical School

James Bernard Erdmann, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Pontifical College Josephinum; M.A. 1964, Ph.D. 1966, Loyola University of Chicago

Mary Frances Kelly Ericksen, *Special Lecturer in Anatomy*
B.A. 1947, Indiana University; M.A. 1957, Columbia University; Ph.D. 1973, George Washington University

Richard Vernon Erkenbeck, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1952, University of Maryland; M.D. 1956, George Washington University

Lawrence Joseph Eron, *Assistant Clinical Professor of Medicine*
B.A. 1966, Princeton University; M.D. 1971, Harvard University

Elaine Carol Esber, *Assistant Clinical Professor of Child Health and Development*
B.A. 1961, Kent State University; M.D. 1965, Ohio State University

James Lawrence Evans, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, Middlebury College; M.D. 1961, Thomas Jefferson University

John McCallum Evans, *Professor of Medicine*
B.A. 1935, Denison University; M.D. 1939, State University of New York at Buffalo

Richard Evans III, *Assistant Clinical Professor of Child Health and Development and of Medicine*
B.A. 1957, Colorado College; M.D. 1961, University of Colorado

Sergio Egidio Fabro, *Professor of Obstetrics and Gynecology and Research Professor of Pharmacology*
M.D. 1956, University of Milan; Ph.D. 1966, Ph.D. 1968, University of Rome; Ph.D. 1967, University of London

David Nathaniel Fox Fairbanks, *Associate Clinical Professor of Otolaryngology*
B.S. 1960, M.D. 1963, University of Utah

Nancy Ellen Smolen Falk, *Clinical Instructor in Medicine*
B.A. 1967, University of Massachusetts; M.D. 1971, State University of New York Downstate Medical Center

Richard Jay Falk, *Assistant Professor of Obstetrics and Gynecology*
B.A. 1962, M.S., M.D. 1966, University of Vermont

Joseph Leon Falkson, *Associate Professorial Lecturer in Health Care Sciences*
B.A. 1964, Brandeis University; M.A. 1965, Ph.D. 1971, University of Michigan

Judith Catherine Fallon, *Assistant Clinical Professor of Health Care Sciences and of Child Health and Development*
B.A. 1965, Regis College, Massachusetts; M.D. 1969, Medical College of Pennsylvania

Marion Dees Miller Faris, *Assistant Clinical Professor of Radiology*
B.A. 1943, Queens College, North Carolina; M.N. 1945, Case Western Reserve University; M.D. 1950, University of Virginia

John Anthony Farrell, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.B. 1940, M.D. 1941, Northwestern University

Philip Marshall Farrell, *Assistant Research Professor of Child Health and Development*
B.A. 1967, M.D., Ph.D. 1970, St. Louis University

Jalal Fatemi, *Assistant Clinical Professor of Medicine*
M.D. 1966, Tehran University

Henry Leon Feffer, *Professor of Orthopaedic Surgery*
B.A. 1939, Indiana University at Bloomington; M.D. 1942, Indiana University at Indianapolis

James Joseph Feffer, *Professor of Clinical Engineering and of Medicine*
B.A. 1935, Indiana University at Bloomington; M.D. 1938, Indiana University at Indianapolis

David Feigin, *Assistant Clinical Professor of Radiology*
B.A. 1966, Cornell University; M.D. 1970, New York University

Carl Bruce Feinstein, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1963, University of Chicago; M.D. 1968, State University of New York Downstate Medical Center

Morris Feitel, *Clinical Professor of Child Health and Development*
M.D. 1957, George Washington University

Bruce Allen Feldman, *Assistant Clinical Professor of Otolaryngology*
B.A. 1962, B.Med.S. 1963, Dartmouth College; M.D. 1965, Harvard University

Melvin Louis Feldman, *Assistant Clinical Professor of Child Health and Development*
B.S. 1960, George Washington University; M.D. 1964, University of Vermont

William Robert Felts, Jr., *Associate Professor of Medicine*
B.S. 1944, M.D. 1946, University of Arkansas

Joseph Fenton, *Associate Clinical Professor of Medicine (Clinical Psychology)*
B.S. 1938, M.A. 1939, New York University; Ed.D. 1952, Columbia University

Leslie Howard Fenton, *Assistant Clinical Professor of Medicine*
M.D. 1959, University of London

Leon Ferber, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1933, Vanderbilt University; M.D. 1937, University of Tennessee

Edward Egner Ferguson, *Clinical Professor of Urology*
M.D. 1936, George Washington University

William Ferguson, *Assistant Clinical Professor of Surgery*
B.S. 1932, Carson-Newman College; M.D. 1935, University of Tennessee

Edward Joseph Feroli, *Special Lecturer in Child Health and Development*
B.S. 1955, Massachusetts College of Pharmacy; B.S. 1956, Tufts University; M.D. 1960, George Washington University

Louis Earl Fettig, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1943, Pennsylvania State University; M.D. 1947, Hahnemann Medical College

Marc Fialco, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1961, Ohio University; M.D. 1965, University of Cincinnati

Annette Heiser Ficker, *Assistant Professor of Child Health and Development*
B.A. 1965, Trinity College, District of Columbia; M.D. 1969, St. Louis University

Stuart Michael Fidler, *Assistant Clinical Professor of Medicine*
B.A. 1963, Cornell University; M.D. 1967, State University of New York Upstate Medical Center

Alan Fields, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.D. 1970, State University of New York Downstate Medical Center

Bernard Emmett Filner, *Assistant Professor of Anesthesiology*
B.A. 1965, Oberlin College; M.D. 1969, Yeshiva University

Ben Sion Fine, *Associate Research Professor of Ophthalmology*
M.D. 1953, University of Toronto

James David Finkelstein, *Professor of Medicine*
B.A. 1954, Harvard University; M.D. 1958, Columbia University

Joseph LeRoy Firoved, *Special Lecturer in Radiology*

Karla Helen Fischer, *Instructor in Allied Health (Pathology)*
B.S. 1966, Vermont College

Max Fischer, *Associate Clinical Professor of Otolaryngology and of Child Health and Development*
M.D. 1946, Georgetown University

Robert Andrew Fischer, *Associate Clinical Professor of Medicine*
B.A. 1954, Columbia University; M.D. 1958, Cornell University

Roland Fischer, *Professorial Lecturer in Pharmacology*
M.S., Ph.D. 1945, University of Basel, Switzerland

Salvatore Francis Fiscina, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1963, Harvard University; M.D. 1967, University of Rochester; J.D. 1973, George Washington University

Ralph Marshall Fisher, *Special Lecturer in Radiology*

Donald Jay Fishman, *Associate Clinical Professor of Neurology and of Child Health and Development*
B.S. 1956, M.D. 1959, University of Illinois

Peter Harvey Fishman, *Lecturer in Biochemistry*
B.S. 1961, Massachusetts Institute of Technology; M.S. 1967, Ph.D. 1970, George Washington University

Marshall Duvall Fitz, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Georgetown University; M.D. 1967, University of Missouri

Alf Lee Fjordbotten, *Assistant Clinical Professor of Ophthalmology*
M.D. 1944, University of Alberta

Richard Leroy Flax, *Assistant Clinical Professor of Surgery*
B.S. 1962, M.D. 1966, University of Maryland

Edward Stitt Fleming, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, University of North Carolina; M.A. 1953, University of Texas; M.D. 1957, George Washington University

Anne Bosshard Fletcher, *Associate Professor of Child Health and Development*
B.A. 1960, Clark University; M.D. 1964, Washington University

Eleanor Coloma Flores, *Assistant Professor of Medicine*
M.D. 1962, University of Santo Tomas, Philippines

Julius Fogel, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1937, University of Virginia

Geneva Scheihing Folsom, *Associate Research Professor of Medicine*
B.M.E. 1945, College of Emporia; M.M.E. 1950, University of Kansas; Ed.D. 1966, University of Alabama

Arlene Saunders Fonaroff, *Assistant Professorial Lecturer in Psychiatry and Behavioral Sciences*
B.A. 1965, M.P.H. 1967, University of California, Los Angeles; M.Phil. 1972, Ph.D. 1973, George Washington University

Marvin Peace Footer, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1938, M.D. 1942, George Washington University

Vivian Berkhouse Ford, *Clinical Instructor in Obstetrics and Gynecology (Nurse Midwifery)*

David Forman, *Assistant Professorial Lecturer in Physiology*
B.A. 1964, Harvard University; Ph.D. 1971, Rockefeller University

Ulla M-Son Fortune, *Assistant Clinical Professor of Orthopaedic Surgery*
M.D. 1965, George Washington University

William Patrick Fortune, *Associate Professor of Orthopaedic Surgery and of Medicine*
B.S. 1953, Springfield College; M.D. 1965, George Washington University

Byron Earl Fossieck, Jr., *Assistant Professor of Medicine*
B.A. 1961, Drury College; M.D. 1965, Northwestern University

William Joseph Fouty, *Professor of Surgery*
B.S. 1952, M.D. 1957, Ohio State University

Karyle Zeffie Fowler, *Clinical Instructor in Child Health and Development*
B.S. 1964, M.D. 1968, Howard University

Mary Alice Vann Fox, *Assistant Clinical Professor of Child Health and Development*
B.A. 1944, University of North Carolina at Greensboro; M.D. 1948, University of Pennsylvania

Mary Ruth Johns Fox, *Assistant Clinical Professor of Child Health and Development*
M.D. 1967, State University of New York Upstate Medical Center

Samuel Mickle Fox III, *Professorial Lecturer in Medicine*
B.A. 1944, Haverford College; M.D. 1947, University of Pennsylvania

Daniel Francis Fragnul, *Assistant Professor of Medicine*
M.D. 1950, University of Padua, Italy

David Hirsch Fram, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Cornell University; M.D. 1963, Yale University

Jack David Francis, *Clinical Instructor in Urology*
B.A. 1965, M.D. 1968, George Washington University

John Joseph Francis, *Associate Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1937, M.D. 1940, Vanderbilt University

Arthur Frank, *Assistant Clinical Professor of Medicine*
B.S. 1956, Massachusetts Institute of Technology; M.S. 1958, University of Pennsylvania; M.D. 1962, New York University

Colin Frank, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1966, Columbia University; M.S. 1969, Ph.D. 1971, University of Oklahoma

Justin Arthur Frank, Jr., *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, University of California, Berkeley; M.D. 1968, University of Louisville

Martin Frank, *Assistant Professor of Physiology*
B.A. 1969, M.S. 1971, Ph.D. 1973, University of Illinois

Randolph Adams Frank, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1946, M.D. 1948, Vanderbilt University

Bennett Frank Frankel, *Assisant Clinical Professor of Surgery (Oral Surgery)*
D.M.D. 1967, University of Pennsylvania

Bernard Leonard Frankel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1963, City University of New York, City College; M.D. 1967, Yeshiva University

Calvin Jefferson Frederick, *Associate Clinical Professor of Psychiatry and Behavioral Sciences (Medical Psychology)*
B.F.A. 1940, University of Oklahoma; M.A. 1954, Ph.D. 1955, University of California, Los Angeles

Donald Sharp Fredrickson, *Professorial Lecturer in Medicine (Internal)*
B.S. 1946, M.D. 1949, University of Michigan

Frederick John Frensilli, *Clinical Professor of Urology*
B.A. 1957, College of the Holy Cross; M.D. 1961, Georgetown University

Thomas Frey, *Clinical Instructor in Ophthalmology and in Child Health and Development*
B.A. 1955, M.D. 1958, Northwestern University

Adolph Friedman, *Assistant Clinical Professor of Medicine*
B.A. 1939, University of Pennsylvania; M.D. 1943, Thomas Jefferson University

Joseph Marshall Friedman, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1936, M.D. 1939, George Washington University

David Stern Friendly, *Associate Professor of Ophthalmology and of Child Health and Development*
B.A. 1954, Carleton College; M.D. 1958, Columbia University

Agnes Gordon Sampson Fry, *Research Instructor in Medicine*
B.S. 1943, Madison College

Marvin Fuchs, *Clinical Professor of Medicine*
B.S. 1941, City University of New York, City College; M.D. 1944, New York University

Walter Edward Fulps, *Special Lecturer in Radiology*

Maurice Bennett Furlong, Jr., *Assistant Clinical Professor of Pathology (Laboratory Medicine)*
B.A. 1964, Fordham University; M.D. 1968, Harvard University

Richard Leo Gaertner, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1961, Pennsylvania State University; M.D. 1965, Temple University

Edward Elias Gahres, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1950, Rutgers—The State University; M.S. 1951, George Washington University; M.D. 1958, University of Virginia

Dorothy Berlin Gail, *Assistant Research Professor of Medicine*
B.A. 1966, City University of New York, Hunter College; M.A. 1968, Boston University; Ph.D. 1973, Georgetown University

Linda Lou Gallo, *Assistant Professor of Biochemistry*
B.S. 1959, West Virginia University; M.S. 1963, Ph.D. 1969, George Washington University

Jorge Mance Garcia, *Assistant Clinical Professor of Surgery*
M.D. 1964, University of Santo Tomas, Philippines

David John Gardner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, Atlantic Union College; M.D. 1961, Loma Linda University

Sheryl Paige Gardner, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1967, M.D. 1971, University of Oregon

J. Antonio Gargurevich, *Clinical Instructor in Urology*
M.D. 1966, Cayetano Heredia University, Peru

Margaret Lucretia Garrett, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1952, Bucknell University; M.D. 1956, University of Pennsylvania

William Marvin Garrett, *Assistant Clinical Professor of Anesthesiology*
B.S. 1968, Duke University; M.D. 1972, Tulane University

Joe Harvey Gaskin, *Assistant Professor of Medicine*
B.S. 1956, Davidson College; M.D. 1960, University of Pennsylvania

Ronald DeVoe Gaskins, *Assistant Professor of Medicine*
B.S. 1958, College of Charleston; M.D. 1962, Medical University of South Carolina

Paul Theodore Gavaris, *Assistant Clinical Professor of Ophthalmology*
B.S. 1961, Rutgers—The State University; M.D. 1968, George Washington University

William Gee, *Assistant Professor of Surgery*
M.D. 1961, State University of New York Downstate Medical Center

Glenn William Geelhoed, *Assistant Professor of Surgery*
B.A. 1964, B.S. 1965, Calvin College; M.D. 1968, University of Michigan

Byron Genner III, *Associate Clinical Professor of Orthopaedic Surgery*
M.D. 1954, State University of New York at Buffalo

Leon Paul Georges, *Assistant Professor of Medicine*
B.A. 1958, New York University; B.M.S. 1960, M.D. 1963, University of Geneva

Frederic Hanford Gerber, *Assistant Clinical Professor of Radiology*
B.A. 1957, Cornell University; M.D. 1965, Duke University

Leon Gerber, *Associate Clinical Professor of Surgery*
M.D. 1936, George Washington University

Richard Borisow Gerber, *Assistant Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, Amherst College; M.D. 1969, Harvard University

Nasser Ghaed, *Assistant Clinical Professor of Radiology*
M.D. 1963, Shiraz Medical School, Iran

Kamal Ghaemi, *Clinical Instructor in Neurological Surgery*
M.D. 1955, Tehran University

Raymond Edward Gibson, *Assistant Research Professor of Radiology*
B.A. 1969, University of California at Santa Cruz; Ph.D. 1972, University of California at Santa Barbara

Sam Thompson Gibson, *Assistant Clinical Professor of Medicine*
B.S. 1936, Georgia Institute of Technology; M.D. 1940, Emory University

Charles Richard Alsop Gilbert, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1944, University of Virginia

William Steven Gilbert, *Assistant Clinical Professor of Ophthalmology*
B.A. 1957, Cornell University; M.D. 1961, Yeshiva University

Martin Giller, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1962, M.D. 1966, Georgetown University

Barbara Ellen Gilson, *Assistant Professor of Anatomy*
B.A. 1968, Temple University; Ph.D. 1975, Thomas Jefferson University

Allen Louis Ginsberg, *Assistant Professor of Medicine*
B.A. 1962, Princeton University; M.D. 1966, Johns Hopkins University

Stephen Paul Ginsberg, *Assistant Clinical Professor of Ophthalmology*
B.A. 1962, University of California, Los Angeles; M.D. 1966, University of California, San Francisco

Joseph Martin Giordano, *Assistant Professor of Surgery*
B.A. 1963, Georgetown University; M.D. 1967, Thomas Jefferson University

Jeffrey Michael Gitelman, *Assistant Clinical Professor of Surgery (Oral Surgery)*
D.D.S. 1971, Howard University

Allen Martin Glasgow, *Assistant Professor of Child Health and Development*
B.S. 1963, Hampden-Sydney College; M.D. 1967, University of Virginia

Milton Sanford Glatt, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1946, Johns Hopkins University; M.D. 1951, University of Geneva

William Bainbridge Glew, *Assistant Clinical Professor of Ophthalmology*
B.S. 1950, Yale University; M.D. 1953, George Washington University; M.S. 1957, University of Minnesota

William Lloyd Glover, Jr., *Clinical Instructor in Urology*
B.S. 1962, M.D. 1965, University of Tennessee

Konstantine Goanos, *Special Lecturer in Health Care Sciences*

Ira David Godwin, *Associate Clinical Professor of Pathology*
B.S. 1952, M.D. 1955, University of North Carolina

Harvey Robert Gold, *Associate Clinical Professor of Child Health and Development*
B.A. 1956, Lafayette College; M.D. 1960, State University of New York Upstate Medical Center

Michael Stephen Gold, *Associate Professor of Medicine*
B.A. 1959, Harvard University; M.D. 1963, State University of New York Downstate Medical Center

Carl Goldberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1960, American International College; M.A. 1961, University of Wyoming; Ph.D. 1966, University of Oklahoma

Charles Goldberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1968, Temple University

Deborah Lois Baron Goldberg, *Assistant Clinical Professor of Medicine*
B.A. 1964, M.D. 1968, Harvard University

Herbert Abraham Goldberg, *Associate Clinical Professor of Urology*
M.D. 1935, University of St. Andrews, Scotland

Samuel David Goldberg, *Assistant Clinical Professor of Medicine*
B.A. 1965, Franklin and Marshall College; M.D. 1969, University of Maryland

Marianne Rudolf Goldberger, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1953, Radcliffe College; M.D. 1958, New York University

Stephen Gilbert Goldberger, *Assistant Clinical Professor of Medicine*
B.S. 1964, University of Florida; M.D. 1968, University of Mississippi, Jackson

Jerome Norman Goldman, *Assistant Clinical Professor of Ophthalmology*
B.A. 1951, University of Michigan; M.D. 1956, New York University

Kenneth Goldstein, *Assistant Professor of Medicine*
B.A. 1962, Oberlin College; M.D. 1966, Case Western Reserve University

Louis Goldstein, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1934, M.B. 1936, M.D. 1937, University of Cincinnati

Norman Philip Goldstein, *Professorial Lecturer in Neurology*
B.A. 1941, New York University; M.A. 1942, M.D. 1946, George Washington University

Robert Arnold Goldstein, *Assistant Professor of Medicine*
B.A. 1962, Brandeis University; M.D. 1966, Thomas Jefferson University; Ph.D. 1976, George Washington University

Herbert Otto Goller, *Assistant Research Professor of Orthopaedic Surgery*
B.S. (M.E.) 1958, Stevens Institute of Technology; M.S. 1964, Ph.D. 1968, State University of New York at Buffalo

Herbert Stanley Golomb, *Clinical Instructor in Dermatology*
B.A. 1955, University of Pennsylvania; M.D. 1960, State University of New York Downstate Medical Center

Manuel Falcon Gonzales, *Assistant Professor of Anesthesiology*
M.D. 1959, University of Santo Tomas, Philippines

Nelida Gonzalez, *Clinical Instructor in Medicine*
B.A. 1967, City University of New York, Hunter College; M.D. 1971, Georgetown University

Walter Yau Kwai Goo, *Assistant Clinical Professor of Medicine*
B.A. 1960, Harvard University; M.D. 1964, Case Western Reserve University

David John Goodenough, *Associate Professor of Radiology (Radiation Physics)*
B.S. 1967, Ph.D. 1972, University of Chicago

David Henry Goodman, *Assistant Professor of Medicine*
B.A. 1959, University of Pennsylvania; M.D. 1963, George Washington University

Lawrence Roger Goodman, *Assistant Professor of Radiology*
B.S. 1964, University of Michigan; M.D. 1968, State University of New York Downstate Medical Center

Nelson Gates Goodman, *Clinical Instructor in Medicine*
B.A. 1950, M.D. 1954, Johns Hopkins University

Sam Leon Goodman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1963, City University of New York, Brooklyn College; M.D. 1967, Yeshiva University

Richard Gordon, *Associate Research Professor of Radiology*
B.S. 1963, University of Chicago; Ph.D. 1967, University of Oregon

Spencer Gordon, Jr., *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, Princeton University; M.D. 1956, Harvard University

Kenneth Paul Gorelick, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, Rutgers—The State University; M.D. 1967, Harvard University

Harvey Joel Gorfinkel, *Assistant Professor of Medicine*
M.D. 1965, University of Illinois

Barry Charles Gorman, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.S. 1967, Tufts University; M.D. 1971, George Washington University

Patrick Alan Gorman, *Associate Professor of Medicine*
M.B., Ch.B., B.A.O. 1954, Queens University, Ireland; D.C.H. 1956, University of London

Ejnar Gottlieb, *Assistant Clinical Professor of Health Care Sciences*
M.D. 1945, Deutsche-Alpen University, Innsbruck, Austria

Ernest Alva Gould, *Clinical Professor of Surgery*
B.S. 1936, University of Wyoming; M.D. 1939, George Washington University

Suresh Chandra Goyal, *Clinical Instructor in Child Health and Development*
B.S. 1956, Dr. in Ped. 1967, University of Lucknow, India; M.B., B.S. 1961, King George's Medical College, India

Thomas Edward Gran, *Assistant Clinical Professor of Pathology*
B.A. 1969, Wabash College; Ph.D. 1973, Kansas State University

Bernard Grand, *Associate Clinical Professor of Medicine*
B.A. 1958, Union College, New York; M.D. 1962, New York University

John E. Grasinger, *Clinical Instructor in Orthopaedic Surgery*
M.D. 1964, Georgetown University

Carl Ralph Gray, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, Amherst College; M.D. 1962, Case Western Reserve University

Luther Wilson Gray, Jr., *Assistant Clinical Professor of Surgery*
B.A. 1961, University of Pennsylvania; M.D. 1966, George Washington University

Paul Gray, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1939, M.D. 1942, University of Chicago

Beatrice Jeanne Green, *Special Lecturer in Pathology*

Frederick Chapman Green, *Professor of Child Health and Development and of Health Care Sciences*
B.S. 1942, Indiana University at Bloomington; M.D. 1944, Indiana University at Indianapolis

Joseph Pieri Green, *Assistant Clinical Professor of Radiology*
B.A. 1961, University of California, Berkeley; M.D. 1966, Creighton University

Harold Abraham Greenberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1942, M.D. 1945, Temple University

Harrie Warren Greenberg, *Assistant Professor of Child Health and Development*
B.S. 1961, University of Toledo; M.D. 1965, Ohio State University

Robert Milton Greenberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1937, M.D. 1941, George Washington University

Robert Aaron Greenfield, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1961, American University; M.D. 1965, Howard University

Robert Thomas Greenfield, *Special Lecturer in Obstetrics and Gynecology*
B.S. 1954, M.D. 1958, Howard University

Stanley Greenspan, *Assistant Clinical Professor of Child Health and Develop ment and of Psychiatry and Behavioral Sciences*
B.A. 1962, Harvard University; M.D. 1966, Yale University

Tibor Jack Greenwalt, *Clinical Professor of Medicine*
B.A. 1934, M.D. 1937, New York University

Thomas Hamlin Gresinger, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1957, Williams College; M.D. 1961, George Washington University

Jay Grodin, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1961, Hobart and William Smith Colleges; M.D. 1965, Thomas Jefferson University

David Grodsky, *Assistant Clinical Professor of Psychiatry and Behavioral Sci ences*
B.A. 1961, University of California, Los Angeles; M.D. 1965, University of California, Irvi

Martha Winter Gross, *Clinical Instructor in Psychiatry and Behavioral Science*
B.A. 1968, University of Wisconsin; M.S.W. 1971, University of Chicago

Peter Leonard Gross, *Instructor in Urology*
B.S. 1963, Hobart and William Smith Colleges; M.D. 1968, New York University

Richard Lee Gross, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1956, Muhlenberg College; M.D. 1960, Hahnemann Medical College

John Henry Grossman III, *Instructor in Obstetrics and Gynecology*
B.A. 1967, M.D. 1971, University of Rochester

Vincent Livingston Guandolo, *Assistant Clinical Professor of Child Health and Development*
B.A. 1953, Kenyon College; M.D. 1962, George Washington University

Arthur Guarinello, *Instructor in Health Care Sciences and in Child Health and Development*
M.D. 1973, State University of New York Downstate Medical Center

John Gregory Guccion, *Assistant Professor of Pathology*
B.A. 1958, John Carroll University; M.D. 1962, Georgetown University

Atin Guha, *Assistant Professor of Medicine*
M.D. 1962, Calcutta National Medical Institute

Grace Hughes Guin, *Associate Clinical Professor of Pathology*
B.S. 1938, Birmingham-Southern College; M.D. 1943, Vanderbilt University

Barbara Guller, *Assistant Professor of Child Health and Development*
M.D. 1960, University of Zurich, Switzerland; M.S. 1968, University of Minnesota

Stephen Flack Gunther, *Associate Professor of Orthopaedic Surgery*
B.A. 1963, Yale University; M.D. 1967, Albany Medical College of Union University

Michael Joel Guralnick, *Clinical Instructor in Child Health and Development (Psychology)*
B.A. 1962, University of Michigan; M.S. 1964, Ph.D. 1967, Lehigh University

Gordon Guroff, *Professorial Lecturer in Biochemistry*
B.S. 1954, University of Illinois; M.S. 1956, Auburn University; Ph.D. 1959, University Wisconsin

Milton Gusack, *Clinical Professor of Medicine*
B.A. 1937, M.D. 1941, Johns Hopkins University

Richard Steele Guy, *Assistant Clinical Professor of Obstetrics and Gynecol*
B.A. 1948, B.S. 1949, Ohio State University; M.D. 1956, Meharry Medical College

Melvyn Robert Haas, *Associate Clinical Professor of Psychiatry and Behavi Sciences*
B.A. 1960, University of Pennsylvania; M.D. 1964, Georgetown University

Stephen Samuel Haas, *Assistant Clinical Professor of Orthopaedic Surgery*
M.D. 1965, University of Oklahoma

Paul Adrian Haber, *Assistant Clinical Professor of Medicine*
B.A. 1941, University of Texas at Austin; M.A. 1942, Columbia University; M.D. 1949, University of Texas Medical Branch at Galveston; M.S. in P.A. 1968, George Washington University

John Thomas Hagenbucher, *Assistant Clinical Professor of Medicine*
B.S. 1950, Philadelphia College of Pharmacy and Science; M.D. 1957, George Washington University

Fred Ernst Hahn, *Professorial Lecturer in Pharmacology*
Ph.D. 1948, University of Kiel, Germany

Michael Joseph Halberstam, *Assistant Clinical Professor of Medicine*
B.A. 1953, Harvard University; M.D. 1957, Boston University

Wilson Luther Hall, *Assistant Clinical Professor of Medicine*
B.A. 1943, College of Wooster; M.D. 1947, George Washington University

Beatrix McCleary Hamburg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1944, Vassar College; M.D. 1948, Yale University

David Alan Hamburg, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1944, M.D. 1947, Indiana University

Wilbur Albert Hamman, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1950, Occidental College; M.D. 1955, University of Chicago

Suzanne Dorothy Schubert Hammersberg, *Assistant Professor of Medical Technology in Pathology*
B.S. 1957, University of Wisconsin—LaCrosse

Mary Kathryn Hammock, *Clinical Instructor in Neurological Surgery*
B.S. 1959, University of Miami; M.D. 1967, Northwestern University

Paul Hamosh, *Special Lecturer in Child Health and Development and in Psychiatry and Behavioral Sciences*
M.D. 1959, Hebrew University, Israel

Dennis John Hand, *Assistant Clinical Professor of Medicine*
M.D. 1960, University of Edinburgh

Philip Handler, *Distinguished Professor of Science*
B.S. 1936, City University of New York, City College; Ph.D. 1939, University of Illinois

Verna Elizabeth Hanes, *Instructor in Medicine*
B.A. 1968, M.D. 1971, George Washington University

Ruth Samuels Hanft, *Professorial Lecturer in Health Care Sciences*
B.S. 1949, Cornell University; M.A. 1963, City University of New York, Hunter College

Harold Cecil Harder, *Assistant Professor of Pharmacology*
B.S. 1964, Alma College, Michigan; M.S. 1966, Ph.D. 1970, Michigan State University

George White Hardman, Jr., *Assistant Clinical Professor of Child Health and Development*
B.A. 1954, M.D. 1958, Johns Hopkins University

Eugene Alexander Hargrove, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1939, M.D. 1942, University of Texas

Aldon Hood Harken, *Assistant Professor of Surgery*
B.A. 1963, Harvard University; M.D. 1967, Case Western Reserve University

Forest Klaire Harris II, *Assistant Clinical Professor of Medicine*
B.S. 1949, M.D. 1953, George Washington University

Thomas Lees Hartman, *Assistant Clinical Professor of Medicine*
B.A. 1936, Muhlenberg College; M.A. 1938, University of Texas; M.D. 1943, Johns Hopkins University

Jack Wayne Harvey, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1959, M.D. 1963, George Washington University

William Herbert Harvey, *Assistant Clinical Professor of Medicine*
B.S. 1952, Wagner College; M.D. 1956, Albany Medical College of Union University

Donald David Haut, *Assistant Clinical Professor of Medicine*
B.A. 1954, Western Maryland College; M.D. 1958, Temple University

Michael Joel Haut, *Assistant Clinical Professor of Medicine*
B.A. 1963, Franklin and Marshall College; M.D. 1967, University of Pennsylvania

Thomas Cotton Havell II, *Clinical Instructor in Medicine*
B.A. 1963, Ohio Wesleyan University; M.D. 1967, Georgetown University

William John Hawes, *Assistant Clinical Professor of Neurology and of Child Health and Development*
B.A. 1952, California State University, San Jose; M.D. 1960, University of California, San Francisco

Donald Hawkins, *Research Professor of Human Kinetics and Leisure Studies and of Medicine*
B.A. 1958, King's College, Pennsylvania; M.A. 1960, Lehigh University; Ed.D. 1967, New York University

George Joseph Hayes, *Clinical Professor of Neurological Surgery*
B.S. 1940, Catholic University of America; M.D. 1943, Johns Hopkins University

James Leroy Haythe, *Special Lecturer in Health Care Sciences*

Murdock Head, *Airlie Professor of Medical and Public Affairs*
D.D.S. 1947, University of Louisville; M.D. 1953, University of Vermont; J.D. 1958, George Washington University

Barry Hecht, *Assistant Clinical Professor of Medicine*
B.S. 1966, City University of New York, City College; M.D. 1970, Yeshiva University

Clara S. Heffess, *Adjunct Instructor in Pathology*
M.D. 1965, University of Buenos Aires

Lawrence Hefter, *Assistant Clinical Professor of Pathology*
M.D. 1963, University of Chicago

Robert John Heilen, *Clinical Instructor in Orthopaedic Surgery*
B.Ch.E. 1957, The Cooper Union; M.D. 1964, New York University

Dorothy Henderson Heilman, *Professorial Lecturer in Microbiology (Cellular Immunology)*
B.S. 1927, M.D. 1932, Northwestern University; M.S. 1940, University of Minnesota

Achim Jurgen Heintze, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1967, University of Hamburg

George Baird Helfrich, *Assistant Clinical Professor of Surgery*
B.A. 1961, Denison University; M.D. 1965, University of Illinois

Jack Heller, *Assistant Research Professor of Medical and Public Affairs*
B.A. 1952, University of Chicago; LL.B. 1958, Columbia University

Melanie Helm, *Clinical Instructor in Pathology*
B.A. 1964, University of Iowa

Elson Bowman Helwig, *Clinical Professor of Pathology (Dermatologic)*
B.S. 1930, Indiana University at Bloomington; M.D. 1932, Indiana University at Indianapolis

Frederick Barrie Hendricks, *Assistant Clinical Professor of Urology*
B.A. 1958, DePauw University; M.D. 1962, Johns Hopkins University

Maria Mira Herenda, *Special Lecturer in Psychiatry and Behavioral Sciences*
M.D. 1955, Bonn University, Germany

Gilbert Richard Herer, *Professor of Child Health and Development*
B.S. 1953, M.S. 1954, Syracuse University; Ph.D. 1964, Northwestern University

John Clement Hergenrother, *Special Lecturer in Radiology*

Clifford Morris Herman, *Associate Professor of Surgery*
B.A. 1951, B.S. 1955, University of New Hampshire; M.D. 1959, University of Vermont

Monte Arnold Herman, *Assistant Clinical Professor of Medicine*
B.A. 1956, M.D. 1959, George Washington University

Roy Hertz, *Research Professor of Pharmacology and of Obstetrics and Gynecology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

Joseph Herbert Herzberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Cornell University; M.D. 1965, University of Wisconsin

Marc Hertzman, *Assistant Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, M.D. 1969, Harvard University

Helen Hope Hess, *Professor of Neurology and of Biochemistry*
B.A. 1946, B.S. 1948, West Virginia University; M.D. 1951, Harvard University

George Rothwell Hewlett, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1948, Dickinson College; M.D. 1953, Temple University

Jocelyn Muriel Bingley Hicks, *Associate Professor of Child Health and Development and of Pathology*
B.S. 1959, M.S. 1962, University of London; Ph.D. 1971, Georgetown University

George Alfred Higgins, Jr., *Clinical Professor of Surgery*
B.S. 1938, University of New Mexico; M.D. 1942, Harvard University

Janet Lorelei Higgins, *Assistant Clinical Professor of Pathology (Laboratory Medicine)*
B.S. 1963, Rider College

Fred George Hilkert, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, Syracuse University; M.D. 1955, George Washington University

Robert Fuhr Hinckley, *Special Lecturer in Child Health and Development*
B.A. 1955, Bowdoin College; M.D. 1959, Tufts University

Jeanette Dontzow Hines, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1947, Cornell University; M.A. 1957, San Francisco State College; M.A. 1969, New York University

Benny Ray Hinton, *Special Lecturer in Pathology*
B.S. 1961, Louisiana State University

Robert Hirschfeld, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1964, Massachusetts Institute of Technology; M.D. 1968, University of Michigan; M.S. 1972, Stanford University

Gladys Subosky Hirschman, *Assistant Research Professor of Child Health and Development*
M.D. 1967, Buenos Aires University

Howard Lee Hise, Jr., *Special Lecturer in Radiology*

Lawrence Bennett Hobson, *Associate Clinical Professor of Medicine*
B.A. 1935, University of Arkansas; Ph.D. 1941, University of Cincinnati

Cornelia Hoch-Ligeti, *Clinical Professor of Pathology*
M.D. 1931, University of Vienna

Leroy Edward Hoeck, *Clinical Professor of Child Health and Development*
M.D. 1937, University of Iowa

Howard Alan Hoffman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, M.D. 1962, Case Western Reserve University

Julius Hoffman, *Special Lecturer in Psychiatry and Behavioral Sciences*
B.A. 1941, M.D. 1944, New York University; M.A. 1958, M.M.S. 1962, Ohio State University

Peter Holbrook, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.A. 1966, Yale University; M.D. 1970, University of Pennsylvania

Sheldon Holen, *Clinical Instructor in Surgery (Periodontics)*
D.D.S. 1955, University of Maryland; M.P.H. 1962, Columbia University

Paul Vincent Holland, *Associate Clinical Professor of Medicine*
B.A. 1958, University of California, Riverside; M.D. 1962, University of California, Los Angeles

Peter Marc Holland, *Assisant Professor of Ophthalmology*
B.A. 1965, Clark University; M.D. 1969, New York Medical College

Ariel Cahill Hollinshead, *Research Professor of Medicine (Pharmacology)*
B.A. 1951, Ohio University; M.A. 1955, Ph.D. 1957, George Washington University

Pearl Barbara Holly, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1929, City University of New York, Hunter College; M.S. 1934, M.D. 1938, New York University

Steven LeRoy Horst, *Special Lecturer in Radiology*

David Horwitz, *Assistant Clinical Professor of Medicine*
M.D. 1948, New York University

Norman Harold Horwitz, *Clinical Professor of Neurological Surgery*
B.A. 1945, Princeton University; M.D. 1948, Columbia University

Jean Elliott Howard, *Assistant Clinical Professor of Medicine*
B.A. 1962, University of California, Berkeley; M.S. 1964, Yale University; M.D. 1969, University of California, San Francisco

William Allen Howard, *Clinical Professor of Child Health and Development*
M.D. 1934, Tulane University

James Robert Howe, *Clinical Instructor in Neurological Surgery*
B.A. 1965, Dartmouth College; M.D. 1969, Tufts University

James Weldon Howell, *Associate Clinical Professor of Pathology (Clinical Chemistry)*
B.S. 1957, Hardin-Simmons University; M.D. 1962, University of Texas Southwestern Medical School at Dallas

Milford Kneal Howell, Jr., *Special Lecturer in Health Care Sciences*

George Hsu, *Assistant Clinical Professor of Pathology*
B.S. 1960, Trinity University; M.D. 1969, University of Bologna, Italy

Irene I-Lien Hsu, *Professor of Medicine*
B.S. 1946, St. John's University, China; M.D. 1949, University of Vermont

Kun-yen Huang, *Associate Professor of Microbiology*
M.D. 1959, National Taiwan University; Ph.D. 1967, George Washington University

Richard Huberman, *Clinical Instructor in Ophthalmology*
B.S. 1959, City University of New York, City College; M.D. 1963, University of Health Sciences, Chicago Medical School

Charles Edwin Huckaba, *Adjunct Professor of Clinical Engineering*
B.E. 1944, Vanderbilt University; M.S. 1947, Massachusetts Institute of Technology; Ph.D. 1953, University of Cincinnati

Richard Myall Huffman, *Clinical Instructor in Medicine*
B.A. 1951, Haverford College; M.D. 1955, George Washington University

Rudolph Hugh, *Professor of Microbiology*
B.S. 1948, Michigan State University; Ph.D. 1954, Loyola University of Chicago

Violet Bowen Hugh, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1958, M.D. 1961, George Washington University

Evan Borroum Hume, *Clinical Instructor in Health Care Sciences*
M.D. 1929, Thomas Jefferson University

Wellington Hung, *Professor of Child Health and Development*
B.S. 1953, American University; M.D. 1957, George Washington University

Daniel Robert Hunt, Jr., *Special Lecturer in Pathology*

Archer David Huott, *Assistant Clinical Professor of Neurology*
B.A. 1953, Seton Hall University; M.D. 1958, Marquette University

Arthur Proctor Hustead, *Associate Clinical Professor of Neurological Surgery*
B.S. 1949, M.D. 1952, Yale University

William Siti Nagib Ibrahim, *Clinical Instructor in Ophthalmology*
M.B., B.Ch. 1958, Alexandria University, Egypt

Virginia Grace Ingram, *Assistant Clinical Professor of Child Health and Development*
B.A. 1951, M.D. 1955, Case Western Reserve University

Vincent Michael Iovine, *Clinical Professor of Surgery*
B.S. 1931, Manhattan College; M.D. 1935, Columbia University

Sands Kenyon Irani, *Clinical Instructor in Medicine*
B.A. 1963, University of the South; M.D. 1968, George Washington University

Nelson Sumner Irey, *Clinical Professor of Pathology*
B.S. 1935, M.D. 1938, University of Pittsburgh

Daniel Isaacson, *Clinical Instructor in Otolaryngology*
B.A. 1955, University of New Mexico; M.D. 1964, University of Innsbruck

Norman Harry Isaacson, *Clinical Professor of Surgery*
B.A. 1941, M.D. 1944, New York University

James Izanec, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1967, Xavier University; M.D. 1971, Case Western Reserve University

Michael John Jackson, *Associate Professor of Physiology and Associate Research Professor of Medicine*
B.S. 1963, University of London; Ph.D. 1966, Sheffield University

Eugene Robert Jacobs, *Assistant Clinical Professor of Radiology*
B.A. 1951, Syracuse University; M.D. 1955, State University of New York Upstate Medical Center

Robert Philip Jacobs, *Assistant Professor of Medicine*
M.D. 1968, New York University

Cecil Bryant Jacobson, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1960, University of Utah; M.D. 1964, George Washington University

Marshall Hannis Jacobson, *Associate Clinical Professor of Medicine*
B.A. 1945, M.D. 1948, George Washington University

Irwin Sidney Jaffee, *Assistant Clinical Professor of Otolaryngology*
B.A. 1952, New York University; M.D. 1956, State University of New York Downstate Medical Center

William James Jaffurs, *Clinical Professor of Pathology*
B.S. 1948, Pennsylvania State University; M.D. 1952, Thomas Jefferson University

Bernard William Janicki, *Special Lecturer in Medicine*
B.A. 1953, M.A. 1955, University of Delaware; Ph.D. 1960, George Washington University

Frank Skiff Jannotta, *Associate Professor of Pathology*
B.A. 1951, Williams College; M.D. 1955, University of Pennsylvania

William Dabney Jarman, *Clinical Professor of Urology*
B.S. 1927, Hampden-Sydney College; M.D. 1932, University of Virginia

Hilliard Jason, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1953, McGill University; M.D. 1958, Ed.D. 1961, State University of New York at Buffalo

Jane Olson Jason, *Assistant Professor of Health Care Sciences*
B.A. 1962, Augustana College; M.A. 1972, University of Miami

David Bruce Jenkins, *Assistant Professor of Anatomy*
B.S. 1971, University of Pittsburgh; Ph.D. 1975, Pennsylvania State University

Melvin Jenkins, *Professorial Lecturer in Child Health and Development*
B.A. 1944, M.D. 1946, University of Kansas

Peter Fredrick Jensen, *Special Lecturer in Radiology*

Marc Antoine Jerome, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, Lycee Philippe Guerrier; M.D. 1962, Universite d'Etat d'Haiti

Marianne Thieme Jessee, *Assistant Clinical Professor of Pathology*
B.S. 1954, Martin Luther University, Germany

Frank Bacchus Johnson, *Associate Clinical Professor of Pathology*
B.S. 1940, University of Michigan; M.D. 1944, Howard University

Lent Clifton Johnson, *Special Lecturer in Pathology*
B.S. 1931, M.D. 1935, University of Chicago

Merrill Charles Johnson, *Assistant Clinical Professor of Radiology*
B.S. 1953, Dartmouth College; M.D. 1956, State University of New York at Buffalo; M.S. 1962, University of Rochester

Raymond Bernard Johnson, *Associate Professor of Medicine*
B.A. 1959, Dartmouth College; M.D. 1963, Howard University

Steele Raymond Johnson, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1966, University of Washington; M.D. 1972, George Washington University

Thomas Nick Johnson, *Professor of Anatomy*
B.S. 1944, St. Ambrose College; M.S. 1949, Michigan State University; Ph.D. 1953, University of Michigan

Warren Charles Johnson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1944, Seattle University; M.D. 1947, St. Louis University

Roger Earl Johnsonbaugh, *Assistant Professor of Child Health and Development*
B.A. 1956, Denison University; M.S. 1958, M.D. 1962, University of Cincinnati; Ph.D. 1973, University of North Carolina

Charles Wilson Jones, *Associate Clinical Professor of Medicine*
B.A. 1935, Johns Hopkins University; M.D. 1939, University of Maryland

Emory Eugene Jones, *Special Lecturer in Health Care Sciences*

Gerald Wayne Jones, *Clinical Instructor in Pathology*
B.S. 1965, University of Oklahoma

John Frederick Jones, *Assistant Professor of Anesthesiology and of Child Development*
B.A. 1964, University of Colorado; M.S. 1966, University of Wyoming; M.D. 1970, University of Pennsylvania

Robert William Jones, *Special Lecturer in Radiology*

David Iglauer Joseph, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Yale University; M.D. 1967, Case Western Reserve University

George Joseph, *Assistant Clinical Professor of Child Health and Development*
B.S. 1957, University of Madras; M.B., B.S. 1962, Kerala University; M.P.H. 1969, Johns Hopkins University

Thomas John Joseph, *Assistant Clinical Professor of Pathology*
B.A. 1966, Pennsylvania State University; M.D. 1970, Temple University

William Lewis Joseph, *Associate Professor of Surgery*
B.A. 1958, Ohio University; M.D. 1962, Ohio State University

John Kafka, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1944, Central YMCA Community College; M.S. 1947, University of Chicago; M.D. 1951, Emory University

Hayk Leon Kaftarian, *Clinical Instructor in Child Health and Development*
M.D. 1967, University of Tehran

Kenneth Roman Kahn, *Special Lecturer in Pathology*
B.A. 1971, Doane College

Irwin Howard Kaiser, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1945, Brown University; M.D. 1948, New York Medical College

Paula Reines Kaiser, *Associate Professor of Anesthesiology*
M.B., Ch.B. 1936, University of St. Andrews, Scotland; M.D. 1937, State University of New York

Vicken Vahan Kalbian, *Clinical Instructor in Health Care Sciences*
B.A. 1944, M.D. 1949, American University of Beirut

Herman Leo Kamenetz, *Clinical Professor of Medicine*
B.A. 1943, B.A. 1944, M.S. 1945, M.D. 1952, University of Paris

Naomi Kanof, *Special Lecturer in Dermatology*
B.A. 1931, M.D. 1934, George Washington University

Richard Michael Kapit, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1967, Columbia University; M.D. 1972, New York University

Kenneth Lawrence Kaplan, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1957, B.S. 1958, M.D. 1962, University of Chicago

Sudesh Puri Kapur, *Assistant Professor of Pathology and of Child Health and Development*
M.B.B.S. 1964, Panjab University, India; M.D. 1970, Postgraduate Institute of Medical Education, India

John Alexander Kark, *Assistant Clinical Professor of Medicine*
B.A., M.B. 1966, Oxford University; M.D. 1969, Harvard University

Maya Tolani Karna, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1961, M.G.M. Medical College, India

Ronald John Karpick, *Assistant Clinical Professor of Medicine*
B.A. 1961, University of Rochester; M.D. 1965, Yale University

Karl Radley Katterjohn, *Instructor in Health Care Sciences*
B.A. 1971, Jacksonville University; B.S. 1974, George Washington University

Martin Katz, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1949, City University of New York, Brooklyn College; Ph.D. 1955, University of Texas at Austin

Ronald Alan Katz, *Assistant Clinical Professor of Dermatology*
B.S. 1964, University of Cincinnati; M.D. 1969, University of Maryland

Sol Katz, *Special Lecturer in Medicine (Pulmonary Diseases)*
B.S. 1935, City University of New York, City College; M.D. 1939, Georgetown University

Barry Theodore Katzen, *Assistant Clinical Professor of Radiology*
M.D. 1970, University of Miami

Jacob Joseph Katzow, *Assistant Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, M.D. 1960, Stanford University

Meyer Katzper, *Assistant Professorial Lecturer in Physiology*
B.A. 1957, B.R.E. 1957, Yeshiva University; M.S. 1962, Ph.D. 1967, New York University

Kean Earl Kauffman, *Special Lecturer in Pathology*
B.S. 1970, Juniata College

Richard Miles Kaufman, *Associate Clinical Professor of Medicine*
B.A. 1955, M.D. 1958, George Washington University

Ronald Paul Kaufman, *Professor of Medicine; Vice President for Medical Affairs and Executive Dean of the Medical Center*
B.S. 1951, Trinity College, Connecticut; M.D. 1955, University of Pennsylvania

Morton Kavalier, *Clinical Instructor in Medicine*
B.A. 1965, University of Pennsylvania; M.D. 1969, Thomas Jefferson University

Frank James Kavanaugh, *Associate Research Professor of Medical and Public Affairs*
B.A. 1956, Lake Forest College

Salman Owais Kazmi, *Clinical Instructor in Urology*
B.S. 1961, University of Karachi, Pakistan; M.B., B.S. 1967, University of Dacca, Bangladesh

Charles Keck, *Clinical Professor of Orthopaedic Surgery*
B.A. 1949, M.D. 1953, Duke University

Albert Edward Keen, *Special Lecturer in Health Care Sciences*

Christine Waples Kehne, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1942, Bryn Mawr College; M.D. 1949, Johns Hopkins University

Wilmer Deaver Kehne, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1942, Amherst College; M.D. 1945, Johns Hopkins University

Robert Keimowitz, *Associate Professor of Medicine and of Health Care Sciences; Associate Dean for Student Affairs and Admissions, Medical Center*
B.A. 1961, M.S. 1963, M.D. 1965, University of Vermont

Robert West Keisling, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1971, University of Tennessee

George Archibald Kelser, Jr., *Professor of Medicine*
B.S. 1946, Harvard University; M.D. 1949, George Washington University

Bernard Kemp, *Professorial Lecturer in Clinical Engineering*
B.S. 1949, University of North Carolina; Ph.D. 1957, Vanderbilt University

Byron Atlas Kendall, *Special Lecturer in Radiology*

John Kenealy, *Associate Clinical Professor of Urology*
B.A. 1948, Syracuse University; M.D. 1952, State University of New York Upstate Medical Center

Peter Ignatius Kenmore, *Professor of Orthopaedic Surgery*
M.D. 1947, Hahnemann Medical College

Marie-Louise Levy Kennedy, *Associate Professor of Anesthesiology*
B.S. 1943, College De Ville Franche, De Rouergue, France; M.D. 1952, Strasbourgh Medical School

John Andrew Kenney, Jr., *Special Lecturer in Child Health and Development and in Dermatology*
B.S. 1942, Bates College; M.D. 1945, Howard University

Richard Alec Kenney, *Professor of Physiology*
B.S. 1945, Ph.D. 1947, University of Birmingham

Stephen Gabriel Kent, *Associate Professor of Pathology*
B.A. 1956, M.D. 1960, Case Western Reserve University

James Michael Kerns, *Assistant Professor of Anatomy*
B.A. 1966, St. Olaf College; M.S. 1968, Ph.D. 1972, Purdue University

John Mark Keshishian, *Associate Clinical Professor of Surgery*
M.D. 1950, George Washington University

Israel Kessler, *Associate Clinical Professor of Medicine*
B.A. 1929, M.S. 1930, University of Pennsylvania; M.D. 1934, Temple University

Kenneth Kessler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, M.D. 1969, Temple University

Harry Jay Kicherer, *Associate Clinical Professor of Radiology*
M.D. 1948, George Washington University

Hyun Wha Kim, *Associate Professor of Child Health and Development*
M.D. 1942, To-Ho University, Japan

Christina Eve Jensen Kimball, *Assistant Clinical Professor of Child Health and Development*
B.A. 1961, Wellesley College; M.D. 1965, University of Virginia

Phyllis Dawn Kind, *Associate Professor of Microbiology*
B.A. 1955, Montana State University; M.S. 1956, Ph.D. 1960, University of Michigan

Joseph King, *Associate Clinical Professor of Medicine*
B.A. 1941, Princeton University; M.D. 1944, Johns Hopkins University

Lawrence Marion King, Jr., *Associate Clinical Professor of Ophthalmology*
B.S. 1948, Louisiana Tech University; M.D. 1953, Louisiana State University in New Orleans

Gideon Musyimi Kioko, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1964, University of Scranton; M.D. 1969, Meharry Medical College

John Patrick Kirchner, *Assistant Professor of Medicine*
B.A. 1963, Iowa State University of Science and Technology; M.D. 1967, Loyola University of Chicago

Peter Thomas Kirchner, *Assistant Professor of Radiology*
B.A. 1960, Yale University; M.D. 1964, Columbia University

Stanley Martin Kirson, *Assistant Clinical Professor of Surgery*
B.A., M.D., 1957, George Washington University

Stanley William Kirstein, *Associate Clinical Professor of Medicine*
B.A. 1939, M.D. 1943, George Washington University

Hans Joachim Klapproth, *Assistant Clinical Professor of Urology*
M.D. 1951, University of Hamburg

Jack Kleh, *Associate Clinical Professor of Medicine*
B.A. 1942, M.D. 1944, George Washington University

Morris Kleinerman, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1929, City University of New York, City College; M.D. 1933, University of St. Andrews, Scotland

James Michael Klick, *Assistant Professor of Anesthesiology*
B.A. 1966, La Salle College; M.D. 1970, Thomas Jefferson University

Calvin Trexler Klopp, *Warwick Professor of Surgery (Cancer); Medical Director, Ambulatory Care Division*
B.A. 1934, Swarthmore College; M.D. 1938, Harvard University

Philip Klubes, *Associate Professor of Pharmacology*
B.S. 1956, City University of New York, Queens College, M.S. 1959, Ph.D. 1962, University of Minnesota

Panpit Pansuwana Klug, *Associate Professor of Medicine*
M.D. 1955, University of Medical Sciences, Thailand

Anne Lowe Knasel, *Instructor in Child Health and Development*
B.A. 1963, Lake Erie College; M.D. 1968, Boston University

William Knaus, *Clinical Instructor in Health Care Sciences*
B.S. 1968, Widener College; M.D. 1972, West Virginia University

Stanley Marc Knoll, *Assistant Clinical Professor of Surgery*
B.S. 1964, University of Pittsburgh; M.D. 1968, University of Health Sciences, Chicago Medical School

Arthur Irwin Kobrine, *Assistant Professor of Neurological Surgery*
B.A. 1964, M.D. 1968, Northwestern University

Barbara Koch, *Instructor in Child Health Development*
B.A. 1968, Clark University; M.D. 1972, Boston University

Edward Graeme Koch, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1964, M.A. 1965, University of California, Los Angeles; M.D. 1969, George Washington University

Marilyn Jean Koering, *Associate Professor of Anatomy*
B.A. 1960, College of St. Scholastica; M.S. 1963, Ph.D. 1967, University of Wisconsin

Israel Kogan, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1965, New York University; M.D. 1969, State University of New York at Buffalo

Leonard Kogan, *Clinical Instructor in Ophthalmology*
M.D. 1957, University of Maryland

Saul Kalman Kolansky, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Temple University; M.D. 1965, Georgetown University

Helen Kahle Kolbe, *Assistant Research Professor of Medical and Public Affairs*
B.A. 1950, Houghton College; M.S. 1972, Cathoic University of America

Edward Ronald Kolvereid, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1956, Ohio University; M.D. 1960, Ohio State University

Toru Komai, *Assistant Research Professor of Radiology (Nuclear Medicine)*
M.S. 1967, Ph.D. 1973, Kyoto University, Japan

George Matthew Korengold, *Clinical Instructor in Child Health and Development*
B.A. 1968, University of Pennsylvania; M.D. 1972, George Washington University

Marvin Curtis Korengold, *Assistant Clinical Professor of Neurology*
D.D.S. 1945, B.S. 1947, M.B. 1949, M.D. 1950, University of Minnesota

Bernardo Kotelanski, *Assistant Clinical Professor of Medicine*
M.D. 1964, University of Buenos Aires

Herbert Louis Kotz, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1953, M.D. 1956, George Washington University

Spiridon Koulouris, *Clinical Instructor in Neurological Surgery*
M.D. 1960, University of Salonika, Greece

Barton Kraff, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1961, University of Rochester; M.D. 1965, State University of New York at Buffalo

Norman Clifford Kramer, *Professor of Medicine*
B.S. 1948, The Citadel; M.S. 1950, M.D. 1954, George Washington University

Robert Kramer, *Clinical Instructor in Medicine*
B.A. 1949, Indiana University; M.D. 1956, University of Geneva

August Kramm, *Assistant Professorial Lecturer in Obstetrics and Gynecology*
B.A. 1936, M.D. 1940, Georgetown University

Leo Edward Kreuz, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Harvard University; M.D. 1964, Johns Hopkins University

Malvin Donald Krinn, *Clinical Instructor in Ophthalmology*
M.D. 1965, University of Illinois

Morris Edward Krucoff, *Associate Clinical Professor of Otolaryngology*
B.S. 1937, M.D. 1942, George Washington University

John James Kuhn, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1934, M.D. 1938, Georgetown University

Lucas Kulczycki, *Special Lecturer in Child Health and Development*
B.S., D.V.M. 1936, University of Lwow, Poland; M.D. 1946, University of Edinburgh; D.P.H. 1948, University of London; D.C.H. 1950, Royal College of Physicians and Surgeons, England

Walter Kurland, *Assistant Professor of Medicine*
B.S. 1942, M.D. 1945, George Washington University

William Kurstin, *Assistant Clinical Professor of Medicine*
B.S. 1941, M.D. 1943, George Washington University

Ronald Kurz, *Associate Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1955, New York University; Ph.D. 1960, Indiana University

Stephen Jay Kurzbard, *Assistant Clinical Professor of Radiology*
B.A. 1958, New York University; M.D. 1962, Yeshiva University

David Howard Kushner, *Professorial Lecturer in Obstetrics and Gynecology*
B.S. 1926, M.D. 1928, Georgetown University

Edward Irving Kushner, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. in Med. 1947, University of Nebraska; M.D. 1949, New York Medical College

Jack Kushner, *Clinical Instructor in Neurological Surgery*
B.A. 1960, Tulane University; M.D. 1964, University of Alabama in Birmingham

Truvor Vadym Kuzmowych, *Instructor in Medicine*
B.A. 1965, La Salle College; M.D. 1969, Thomas Jefferson University

William Thurston Lady, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1938, George Washington University

Alfred Shing-Tai Lai, *Clinical Instructor in Medicine*
M.D. 1970, National Taiwan University

Joe Hazle Lamkin, *Special Lecturer in Health Care Sciences*
B.S. 1958, University of Kentucky

Barry Landau, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1963, Columbia University; M.D. 1966, New York University

Paul Allan Lange, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, M.D. 1967, University of Chicago

David Arthur Lanham, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1951, M.D. 1955, St. Louis University

David Lloyd Lanter, *Clinical Instructor in Ophthalmology*
B.S. 1959, City University of New York, Queens College; M.D. 1963, New York Medical College

Francis Gerald LaPiana, *Assistant Clinical Professor of Ophthalmology*
M.D. 1962, George Washington University

Joseph Charles La Porte, *Special Lecturer in Pathology*

John LaRosa, *Associate Professor of Medicine and of Health Care Sciences*
B.S. 1961, M.D. 1965, University of Pittsburgh

Harold Nickolai Larsen, *Special Lecturer in Health Care Sciences*

John Walter Larsen, Jr., *Assistant Professor of Obstetrics and Gynecology*
B.A. 1964, Dartmouth College; M.D. 1968, Cornell University

Joseph Bruce Laskowski, *Special Lecturer in Health Care Sciences*

Wilbur Darrell Latham, *Associate Clinical Professor of Surgery*
B.S. 1950, Mississippi College; M.D. 1953, Tulane University

John Wilmer Latimer, Jr., *Associate Clinical Professor of Medicine*
M.D. 1940, George Washington University

Henry Prather Laughlin, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1937, Ursinus College; M.D. 1941, Temple University

Robert Alan Lavine, *Associate Professor of Physiology*
B.S. 1962, Ph.D. 1969, University of Chicago

Stanford Lavine, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1950, M.D. 1954, University of Maryland

Charles Edward Law, Sr., *Assistant Clinical Professor of Medicine*
M.D. 1939, George Washington University

Thomas Longley Lawson, *Associate Professor of Radiology*
M.D. 1965, University of Michigan

Allan Michael Lazarus, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1965, City University of New York, Brooklyn College; M.D. 1969, New York University

Arnold Albert Lear, *Associate Clinical Professor of Medicine*
M.D. 1950, Harvard University

Henry David Lederer, *Professorial Lecturer in Psychiatry and Behavioral Sciences*
B.S. 1934, M.D. 1937, University of Chicago

Martin Edward Lederman, *Clinical Instructor in Ophthalmology and in Child Health and Development*
B.A. 1960, City University of New York, Brooklyn College; M.D. 1964, Yeshiva University

Don Seung Lee, *Assistant Professor of Anesthesiology*
M.D. 1966, Catholic Medical College, Korea

Sang Nam Lee, *Assistant Professor of Radiology*
M.D. 1965, Catholic Medical College, Korea

Son Taek Lee, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1962, Seoul National University

Leonard Lefkowitz, *Assistant Clinical Professor of Child Health and Development*
B.A. 1957, Alfred University; M.D. 1962, University of Health Sciences, Chicago Medical School

Glenn Duane Legler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1954, St. Olaf College; M.D. 1958, University of Wisconsin

Harold Bernard Lehrman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1939, Bowdoin College; M.D. 1943, Tufts University

Sanford Leon Leikin, *Professor of Child Health and Development*
M.D. 1947, University of Louisville

Edward Joseph Leonard, *Associate Clinical Professor of Medicine*
M.D. 1949, Harvard University

Fred Leonard, *Research Professor of Medicine (Rehabilitation Medicine) and of Orthopaedic Surgery; Associate Dean for Research of the Medical Center*
B.S. 1938, University of Arkansas; M.S. 1942, Ph.D. 1947, Polytechnic Institute of Brooklyn

Edwin Milton Lerner II, *Research Professor of Microbiology*
B.A. 1941, M.D. 1944, Harvard University

May Siang Lim Lesar, *Assistant Professor of Radiology*
M.D. 1966, Wayne State University

Bruce Edward Lessin, *Clinical Instructor in Medicine*
B.S. 1964, University of Wisconsin; M.D. 1967, University of Michigan

Lawrence Stephen Lessin, *Professor of Medicine and of Pathology*
M.D. 1962, University of Chicago

Gordon Sparks Letterman, *Professor of Surgery (Plastic Surgery)*
B.A. 1937, B.S. in Med.Sc. 1940, M.D. 1941, Washington University

Arthur Jerome Levens, *Associate Clinical Professor of Neurology*
B.S. 1940, M.D. 1944, University of Wisconsin

L. David Levi, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Harvard University; M.D. 1964, Cornell University

Jack Louis Levine, *Assistant Clinical Professor of Otolaryngology and of Child Health and Development*
M.D. 1938, George Washington University

Martin Levine, *Adjunct Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Brandeis University; J.D. 1963, Yale University

Arnold Glenn Levy, *Clinical Instructor in Medicine*
B.A. 1968, M.D. 1971, George Washington University

Ann Maria Lewicki, *Professor of Radiology*
B.A. 1956, Albion College; M.D. 1959, Wayne State University

Randall Jeffrey Lewis, *Assistant Professor of Orthopaedic Surgery*
B.A. 1965, Yale University; M.D. 1969, Harvard University

Robert Todd Lewit, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, M.D. 1963, Harvard University

Choh Luh Li, *Clinical Professor of Neurological Surgery*
M.D. 1942, National Medical College of Shanghai; M.S. 1950, Ph.D. 1954, McGill University

Peter Randolph Lichtenthal, *Assistant Professor of Anesthesiology*
B.A. 1967, University of Vermont; M.D. 1972, New York Melical College

David Lichtman, *Assistant Professor of Orthopaedic Surgery*
M.D. 1966, State University of New York Downstate Medical Center

Manfred Wilhelm Lichtmann, *Assistant Clinical Professor of Anesthesiology*
B.S. 1954, Wagner College; M.D. 1963, Thomas Jefferson University

William Edward Lightfoote II, *Assistant Clinical Professor of Neurology*
B.A. 1963, Grinnell College; M.D. 1967, Howard University

Melody Huang Lin, *Assistant Research Professor of Medicine*
B.Pharm. 1968, Taipei Medical College, Taiwan; Ph.D. 1976, George Washington University

Norman William Lindenmuth, *Assistant Professor of Health Care Sciences and of Medicine*
B.S. 1968, Pennsylvania State University; M.D. 1972, Thomas Jefferson University

Edwin James Lieberman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1955, University of California, Berkeley; M.D. 1958, University of California, San Francisco; M.P.H. 1963, Harvard University

Adrian Smith Lineberger, *Associate Clinical Professor of Pathology*
B.S. 1952, M.D. 1955, University of North Carolina

Ralph Burgess Lingeman, *Associate Professor of Pathology*
M.D. 1953, Indiana University

Lewis Edward Lipkin, *Adjunct Professor of Clinical Engineering*
B.A. 1945, M.D. 1949, New York University

Daniel Gordon Lipman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1940, Middlesex Hospital Medical School, England

Steven Howard Lipsius, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Obstetrics and Gynecology*
B.S. 1962, St. Joseph's College, Pennsylvania; M.D. 1963, M.A. 1965, Temple University

George Liss, *Clinical Instructor in Ophthalmology*
B.A. 1955, M.D. 1958, George Washington University; M.S. 1964, Marquette University

Christopher Roland Lissner, *Assistant Clinical Professor of Pathology (Clinical Microbiology)*
B.S. 1970, M.S. 1972, University of Southern California

Philip Roy Littleton, *Clinical Instructor in Child Health and Development*
B.A. 1963, M.D. 1967, University of North Carolina

Chia Ching Liu, *Clinical Instructor in Orthopaedic Surgery*
M.B. 1957, National Taiwan University

Leon McNeely Liverett, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1943, Butler University; M.D. 1945, Indiana University at Indianapolis

John Hayes Lodge, *Assistant Clinical Professor of Ophthalmology*
B.A. 1947, West Virginia University; M.D. 1951, Johns Hopkins University

Marilyn Rosenthal Loeb, *Assistant Research Professor of Microbiology*
B.A. 1951, Barnard College; M.A. 1955, Bryn Mawr College; Ph.D. 1958, University of Pennsylvania

Robert Loeffler, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1963, Columbia University; M.D. 1967, Yeshiva University

James Walling Long, *Assistant Clinical Professor of Medicine*
M.D. 1943, George Washington University

Carl Douglas Lord, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1962, Columbia Union College; M.D. 1966, Loma Linda University

Samuel Dennis Loube, *Clinical Professor of Medicine*
B.A. 1941, M.D. 1943, George Washington University

John Andrew Lowe, *Assistant Clinical Professor of Child Health and Development*
B.A. 1964, Harvard University; M.D. 1968, Tufts University

William Byron Lowe, *Clinical Instructor in Radiology*

Beal Aptheker Lowen, *Clinical Instructor in Medicine*
B.A. 1966, Columbia University; M.D. 1970, Medical College of Virginia of Virginia Commonwealth University

Philip Lowenthal, *Assistant Clinical Professor of Anesthesiology*
B.S. 1935, M.D. 1938, University of Oklahoma

Naomi Corman Luban, *Instructor in Child Health and Development*
B.A. 1968, Connecticut College; M.D. 1972, City University of New York, Mount Sinai School of Medicine

Jean Pitner Lucas, *Assistant Clinical Professor of Medicine*
B.A. 1944, B.S. 1946, University of Mississippi; M.D. 1948, George Washington University

William Matthew Lukash, *Professor of Medicine*
B.S. 1952, Michigan State University; M.D. 1956, University of Michigan

James Lindsay Luke, *Clinical Professor of Pathology (Forensic)*
B.S. 1956, Columbia University; M.D. 1960, Case Western Reserve University

Robert John Lull, *Assistant Clinical Professor of Radiology*
B.A. 1962, Canisius College; M.D. 1966, Albany Medical College of Union University

John William Lyles, *Clinical Instructor in Obstetrics and Gynecology*
B.M.E. 1954, Cornell University; M.D. 1970, George Washington University

Shirley Salus Lynn, *Adjunct Instructor in Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1945, Pennsylvania State University; M.S.W. 1970, Catholic University of America

Carl Charles MacCartee, Jr., *Clinical Instructor in Orthopaedic Surgery*
B.A. 1963, Duke University; M.D. 1967, Georgetown University

Thayer Mills Mackenzie, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1944, Harvard University; M.D. 1947, Johns Hopkins University

Beryce MacLennan, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1947, London School of Economics; Ph.D. 1960, London University

Ivan Vasil Magal, *Clinical Instructor in Medicine*
Th.B. 1944, Baptist Theological Seminary, Hungary; B.A. 1948, Eastern Mennonite College; B.S. 1949, Lebanon Valley College; M.D. 1954, Medical College of Virginia of Virginia Commonwealth University

Csaba Ladislo Magassy, *Clinical Instructor in Surgery (Plastic Surgery)*
B.S. 1958, M.D. 1962, Creighton University

Iradj Mahdavi, *Associate Clinical Professor of Child Health and Development*
M.D. 1956, University of Tehran

John Gail Maier, *Professor of Radiology (Radiation Therapy) and of Obstetrics and Gynecology*
M.D. 1952, St. Louis University; M.S. 1959, University of Colorado; Ph.D. 1963, University of Rochester

Maxwell Sherwood Maillis, *Assistant Clinical Professor of Medicine*
B.S. 1961, M.D. 1965, University of Chicago

Massoud Majd, *Associate Professor of Radiology and of Child Health and Development*
M.D. 1960, University of Tehran

Jocelyn Ruth Schoen Malkin, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1947, Columbia University; M.D. 1952, Yale University

Kalisankar Mallik, *Assistant Research Professor of Medicine*
B.S. 1959, B.Tech. 1961, M.Tech. 1962, Calcutta University; M.S. 1969, George Washington University

Richard Axel Malmgren, *Clinical Professor of Pathology (Cytology)*
B.S. 1942, Wagner College; M.D. 1945, Cornell University

Bayani Lipana Manalo, *Assistant Clinical Professor of Medicine*
B.A. 1962, M.D. 1967, University of the Philippines

Harold George Mandel, *Professor of Pharmacology*
B.S. 1944, Ph.D. 1949, Yale University

Harry Armstrong Mangold, *Assistant Clinical Professor of Child Health and Development*
B.A. 1950, College of Wooster; B.D. 1953, McCormick Theological Seminary; M.D. 1964, University of Cincinnati

James Wesley Manhart, *Assistant Clinical Professor of Pathology (Allied Health Sciences)*
B.A. 1962, Knox College; M.D. 1967, Stanford University

Hildegard Wessel Manitsas, *Assistant Clinical Professor of Anesthesiology*
M.D. 1951, Free University of Berlin

James Packard Mann, *Associate Clinical Professor of Medicine*
M.D. 1947, George Washington University

Emanuele Mannarino, *Assistant Clinical Professor of Neurological Surgery*
M.D. 1951, University of Rome; M.D. 1963, Duke University

Lewis Mantel, *Assistant Professor of Anesthesiology*
B.A. 1961, Cornell University; M.D. 1965, Yeshiva University; M.P.H. 1970, Harvard University

John Allen Maples, *Clinical Instructor in Pathology*
B.A. 1966, Northwestern University; B.S. 1967, Concord College

Allen Elias Marans, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
M.D. 1949, Georgetown University

John Paul Marceau, *Special Lecturer in Health Care Sciences*

Lewis Edward March, *Clinical Instructor in Medicine*
B.A. 1969, M.D. 1973, Case Western Reserve University

Andrew Menges Margileth, *Professor of Child Health and Development*
B.A. 1942, Washington and Jefferson College; B.S. 1944, Massachusetts Institute of Technology; M.D. 1947, University of Cincinnati

Carl Ira Margolis, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1958, Columbia University; M.D. 1963, University of Basel, Switzerland

Richard Sheldon Margolis, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1965, Pennsylvania State University; M.D. 1969, George Washington University

David Mervyn Margulies, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1956, Columbia University; M.D. 1961, Northwestern University

Irwin Henley Marill, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1950, Brown University; M.D. 1954, Hahnemann Medical College

Alfred Francis Marin, *Special Lecturer in Health Care Sciences*

Stanley Marinoff, *Associate Professor of Obstetrics and Gynecology and of Health Care Sciences*
B.A. 1958, University of Pennsylvania; M.D. 1962, University of Health Sciences, Chicago Medical School; M.P.H. 1970, Harvard University

John Lloyd Marlow, *Assistant Professor of Obstetrics and Gynecology*
B.S. 1957, Brigham Young University; M.D. 1961, George Washington University

John Daughtry Marriott, *Associate Clinical Professor of Radiology*
B.A. 1958, M.D. 1962, University of North Carolina

Henry Brandis Marsh, *Assistant Professor of Medicine (Cardiology)*
B.A. 1962, Harvard University; M.D. 1966, Johns Hopkins University

William Laverne Marsh, *Associate Professor of Pathology and of Anesthesiology*
B.S. 1942, Purdue University; M.D. 1946, State University of New York at Buffalo

Lewis West Marshall, *Adjunct Associate Professor of Medicine*
B.S. 1955, M.D. 1959, Howard University

Vernon Edward Martens, *Associate Clinical Professor of Pathology*
B.S. 1935, M.D. 1937, St. Louis University

Clifford Ross Martin, *Clinical Instructor in Pathology (Laboratory Medicine)*
B.A. 1971, California State University, San Jose

Dean Harrington Martin, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1950, George Washington University

Donald Gene Martin, *Clinical Instructor in Pathology (Laboratory Medicine)*
B.S. 1962, M.S. 1965, Idaho State University

Shirley Sue Martin, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1940, Marshall University; M.D. 1943, Medical College of Virginia of Virginia Commonwealth University

Albert Nicholas Martins, *Associate Clinical Professor of Neurological Surgery*
B.S. 1953, M.S. 1956, Fordham University; M.D. 1960, State University of New York Downstate Medical Center

Nina Woo Matheson, *Assistant Research Professor of Health Care Sciences*
B.A. 1956, M.L. 1958, University of Washington

George Joseph Mathews, *Associate Professor of Neurological Surgery*
M.B., B.S. 1962, Madras University, India

Mary Jean Matthews, *Professor of Pathology*
B.A. 1946, M.D. 1949, George Washington University

James Franckle Mayhew, *Assistant Professor of Anesthesiology*
B.S. 1967, Juniata College; M.D. 1969, College of Medicine and Dentistry of New Jersey

Paul Mazel, *Professor of Pharmacology and of Anesthesiology*
B.S. 1946, Medical College of Virginia of Virginia Commonwealth University; M.S. 1955, Trinity University; Ph.D. 1960, Vanderbilt University

Harry Moses McAllister, *Clinical Instructor in Ophthalmology*
B.A. 1936, University of Georgia; M.D. 1949, Johns Hopkins University

Michael McCally, *Associate Professor of Physiology and of Health Care Sciences; Associate Dean for Allied Health Programs of the Medical Center*
B.A. 1956, Princeton University; M.D. 1960, Case Western Reserve University; Ph.D. 1970, Ohio State University

William Hugh McCartney, *Assistant Clinical Professor of Radiology*
B.S. 1967, M.D. 1969, Northwestern University

James Edward McClenathan, *Professor of Surgery and of Child Health and Development*
B.A. 1943, Washington and Jefferson College; M.D. 1947, University of Pittsburgh

Stephen Laurence McCourt, *Special Lecturer in Health Care Sciences*

Mary Jacobs McCrea, *Assistant Research Professor of Ophthalmology and of Physiology*
B.A. 1964, Trinity College, District of Columbia; M.S. 1966, Ph.D. 1969, University of Illinois

Charles Walter McCutchen, *Assistant Clinical Professor of Orthopaedic Surgery (Biomechanics)*
B.A. 1950, Princeton University; M.S. 1952, Brown University; Ph.D. 1957, Cambridge University

Bruce Michael McDonald, *Assistant Professor of Child Health and Development*
B.A. 1962, University of Toronto; M.D. 1966, State University of New York

Norman McElroy, *Instructor for Allied Health in Radiology*
B.A. 1972, M.A. in Ed. 1975, George Washington University

Ross Albert McElroy, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, University of Texas at Austin; M.D. 1961, University of Texas Medical Branch at Galveston

James Jerry McFarland, Jr., *Associate Clinical Professor of Otolaryngology and of Child Health and Development*
B.S. 1935, Cumberland College of Tennessee; M.D. 1938, University of Tennessee Medical Units

Willis Alexander McGill II, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.S. 1963, Westminster College; M.D. 1967, University of Pittsburgh

James Michael McGinnis, *Clinical Instructor in Health Care Sciences and in Medicine*
B.A. 1966, University of California, Berkeley; M.A., M.D. 1971, University of California, Los Angeles

Larry McGowan, *Professor of Obstetrics and Gynecology*
B.S. 1950, Millikin University; B.S. in Med. 1952, M.D. 1954, University of Illinois

Lawrence Edward McGuire, *Special Lecturer in Health Care Sciences*

Brady Piersol McKaig, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1957, University of Notre Dame; M.D. 1961, Cornell University

Douglas William McKay, *Professor of Orthopaedic Surgery and of Child Health and Development*
B.A. 1951, University of Maine at Orono; M.D. 1955, Tufts University

Robert Douglas McKay, *Assistant Clinical Professor of Anesthesiology*
B.S. 1968, St. Peter's College, New Jersey; M.D. 1972, Thomas Jefferson University

William Prentiss McKelway, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1943, Washington and Lee University; M.D. 1950, George Washington University

Donald Harrison McKnew, Jr., *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1955, Yale University; M.D. 1961, Johns Hopkins University

Walter Leo McLean, *Assistant Professor of Child Health and Development*
B.A. 1956, Harvard University; M.D. 1960, Boston University

Vincent McManaman, *Assistant Clinical Professor of Radiology*
B.S. 1963, Saint Joseph's College, Pennsylvania; M.S. 1965, University of Notre Dame; Ph.D. 1971, Purdue University

John Johnson McMillan, *Associate Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1943, Wake Forest University; M.A. 1948, Ph.D. 1951, Duke University

William James McSweeney, *Professor of Radiology and of Child Health and Development*
B.S. 1957, College of the Holy Cross; M.D. 1961, University of Vermont

Donald Chamberlin Meek, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1957, Ohio Wesleyan University; M.D. 1961, Ohio State University

John Edmond Meeks, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1954, Hendrix College; M.D. 1957, University of Tennessee

Dale Richard Meers, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1950, University of Washington; M.S.W. 1956, University of Minnesota; D.S.W. 1967, Catholic University of America

Gordon Weed Mella, *Assistant Clinical Professor of Child Health and Development*
B.S. 1953, Ursinus College; M.D. 1956, Thomas Jefferson University

William Francis Mellen, *Special Lecturer in Radiology*

Milton Meltzer, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1943, M.D. 1946, Ohio State University

Robert Seamen Melville, *Clinical Professor of Pathology (Laboratory Medicine)*
B.A. 1932, Clark University; Ph.D. 1950, University of Iowa

Robert Allen Mendelsohn, *Clinical Instructor in Neurological Surgery*
M.D. 1949, Georgetown University

Sander Holstein Mendelson, *Assistant Professor of Medicine*
B.A. 1956, Wesleyan University; M.D. 1960, New York University

Wallace Brand Mendelson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, University of Texas; M.D. 1969, Washington University

Nicholas Mendjuk, *Clinical Instructor in Medicine*
M.D. 1964, University of Madrid

Jean Hugues Menetrez, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1942, University of Besançon, France; M.D. 1950, McGill University

Maurice Mensh, *Associate Clinical Professor of Medicine*
M.D. 1939, George Washington University

John Frederick Mermel, *Assistant Clinical Professor of Medicine*
B.S. 1956, Georgetown University; M.D. 1960, George Washington University

Carl Ronald Merril, *Professorial Lecturer in Biochemistry*
B.S. 1958, College of William and Mary; M.D. 1962, Georgetown University

Alfred Michael Messore, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1956, Mount St. Mary's College, Maryland; M.D. 1961, State University of New York at Buffalo

Jerry Francis Meyer, *Assistant Professor of Medicine*
M.D. 1963, University of Chicago

Barbara Ann Meyer Meyers, *Clinical Instructor in Medicine*
B.A. 1961, Bryn Mawr College; M.D. 1968, George Washington University

Frederick Meyers, *Assistant Clinical Professor of Medicine*
B.S. 1955, Purdue University; M.D. 1959, University of Cincinnati

Herman Arnold Meyersburg, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1933, M.D. 1938, New York University

Morris Irwin Michael, *Special Lecturer in Child Health and Development*
B.A. 1938, Cornell University; M.D. 1942, George Washington University

Frank Murray Midgley, *Assistant Professor of Surgery and of Child Health and Development*
B.A. 1961, Princeton University; M.D. 1965, Albany Medical College of Union University

Harvey Franklin Midkiff, *Special Lecturer in Radiology*

Thomas Herrick Milhorat, *Professor of Neurological Surgery and of Child Health and Development*
B.S. 1957, M.D. 1961, Cornell University

Hilary Ethel Clara Millar, *Clinical Instructor in Child Health and Development (Psychiatry)*
M.D. 1947, Royal College of Surgeons, Scotland; M.P.H. 1958, Johns Hopkins University

Jack William Millar, *Vivian Gill Professor of Epidemiology and Environmental Health*
B.A. 1945, Stanford University; M.D. 1947, George Washington University; M.P.H. 1951, M.S. in Hygiene and Tropical Medicine 1952, Harvard University

Frank Nelson Miller, Jr., *Professor of Pathology*
B.S. 1943, M.D. 1948, George Washington University

George Edward Miller, *Assistant Research Professor of Radiology*
B.S. 1965, M.E.A. 1976, George Washington University

George Francis Miller, Jr., *Clinical Instructor in Otolaryngology*
M.D. 1958, George Washington University

Glenn Howard Miller, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, University of Iowa; M.D. 1966, University of Chicago

Harry Charles Miller, Jr., *Professor of Urology*
B.A. 1950, Amherst College; M.D. 1954, Yale University

Judith Kimberly Miller, *Assistant Professorial Lecturer in Health Care Sciences*
B.A. 1965, George Washington University; M.A. 1969, Catholic University of America

Valery Thornton Miller, *Clinical Instructor in Health Care Sciences and in Medicine*
B.A. 1958, M.D. 1961, George Washington University

Dorothy Friedlander Millon, *Clinical Instructor in Medicine*
B.A. 1946, M.A. 1948, University of California, Los Angeles; M.D. 1955, University of Chicago

Earl Clarence Mills, *Clinical Instructor in Neurological Surgery*
B.A. 1965, Fisk University; M.D. 1969, Howard University

Mitchell Mills, *Professor of Surgery*
B.A. 1952, Princeton University; M.D. 1956, Cornell University

Irvin Donald Milowe, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1953, Columbia University; M.D. 1957, Cornell University

Harvey Nelson Mininberg, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1960, Brandeis University; M.D. 1965, Yeshiva University

Martin Lloyd Minthorn, Jr., *Professorial Lecturer in Biochemistry*
B.S. 1944, M.S. 1949, University of Nebraska; Ph.D. 1953, University of Illinois

Harold Stanley Mirsky, *Assistant Clinical Professor of Medicine*
B.S. 1959, City University of New York, Brooklyn College; M.D. 1964, State University of New York Upstate Medical Center

Donald Mitchell, *Assistant Clinical Professor of Dermatology*
B.S. 1954, M.D. 1957, University of North Carolina

Bernhard Theodore Mittemeyer, *Associate Clinical Professor of Urology*
B.S. 1952, Moravian College; M.D. 1956, Temple University

Charles Robert Mock, *Instructor in Child Health and Development*
B.A. 1959, M.D. 1963, University of Maryland

Albert Jay Modlin, *Associate Clinical Professor of Child Health and Development*
B.S. 1948, M.S. 1949, M.D. 1954, George Washington University

Barry Modlin, *Clinical Instructor in Otolaryngology*
B.S. 1958, M.S. 1959, M.D. 1963, George Washington University

Mahmood Mohamadi, *Clinical Instructor in Medicine*
M.D. 1965, Tehran University

Irvin Charles Mohler, Jr., *Assistant Research Professor of Medical and Public Affairs*
B.S. 1949, Franklin and Marshall College; M.S. 1952, Pennsylvania State University

Gaetano Francis Molinari, *Professor of Neurology*
B.S. 1957, College of the Holy Cross; M.D. 1961, College of Medicine and Dentistry of New Jersey

Robert Alvin Mollett, *Special Lecturer in Radiology*

William Patrick Monaghan, *Assistant Clinical Professor of Pathology*
B.S. 1968, Old Dominion University; M.S. 1973, Ph.D. 1975, Bowling Green State University

Allen Mendel Mondzac, *Assistant Clinical Professor of Medicine*
B.A. 1958, M.D. 1961, George Washington University

Marvin Ian Mones, *Special Lecturer in Child Health and Development*
B.S. 1940, Villanova University; M.D. 1947, Johns Hopkins University

James Monica, *Special Lecturer in Health Care Sciences*
B.A. 1957, University of the Americas

Richard Montali, *Assistant Clinical Professor of Pathology (Comparative Pathology)*
D.V.M. 1964, Cornell University

George Albert Morales, *Associate Professor of Anesthesiology*
B.S. 1947, M.D. 1951, University of Mexico

David Arthur Morowitz, *Associate Clinical Professor of Medicine*
M.D. 1963, University of Illinois

Glenn Ellis Morris, *Associate Professorial Lecturer in Psychiatry and Behavioral Sciences (Allied Health) and in Health Care Administration*
B.S. 1933, M.A. 1939, University of Illinois; M.S. in H.A. 1956, Northwestern University

Robert Johnathan Morton, Jr., *Clinical Instructor in Radiology*
B.A. 1964, Catawba College; M.S. 1972, University of California, Los Angeles

E. Gnanaraj Moses, *Special Lecturer in Child Health and Development*
B.B.A. 1951, Spicer Memorial College, India; M.A. 1963, Howard University; Ph.D. 1968, University of Maryland

Don Thurston Mosher, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1953, M.D. 1956, University of Kansas

Herbert Alan Moskovitz, *Assistant Clinical Professor of Medicine*
B.S. 1949, Georgia Institute of Technology; M.D. 1954, Emory University

Peter Alan Moskovitz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1965, Haverford College; M.D. 1969, Columbia University

Howard Otis Mott, *Assistant Clinical Professor of Medicine*
B.A. 1941, Union College, New York; M.D. 1944, George Washington University

Mahmoud Mourad, *Professor of Medicine*
B.S. 1940, Ibrahimieh University, Egypt; P.N.S. 1942, M.B., Ch.B., M.D. 1952, Cairo University; M.A. 1960, New York University

Stephen Mourat, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1941, West Virginia University; M.D. 1944, Thomas Jefferson University

Nasser Movassaghi, *Associate Professor of Child Health and Development*
Natural Science 1950, Rahnema College, Iran; M.D. 1956, University of Tehran

Paul Robert Moyer, *Assistant Clinical Professor of Clinical Engineering*
B.S. 1963, Haverford College; M.D. 1967, University of Pennsylvania

Richard Arthur Muesing, *Research Instructor in Medicine*
B.S. 1960, Mankato State College; M.S. 1964, Ph.D. 1969, University of Illinois

Franco Mario Muggia, *Professor of Medicine*
B.S. 1957, Yale University; M.D. 1961, Cornell University

Madan Gopal Mukhopadhyay, *Clinical Instructor in Medicine*
M.B., B.S. 1966, University of Calcutta

Joel Carl Mulhauser, *Assistant Clinical Professor of Medicine*
B.A. 1967, University of Pennsylvania; M.D. 1971, University of Pittsburgh

Alfred Muller, *Assistant Clinical Professor of Medicine*
B.A. 1962, Princeton University; M.D. 1966, Columbia University

Colbert Munson, *Special Lecturer in Health Care Sciences*

Myron Irwin Murdock, *Clinical Instructor in Urology*
B.A. 1964, Boston University; M.D. 1968, George Washington University

Cornelius Francis Murphy, *Associate Clinical Professor of Radiology*
B.S. 1943, Boston College; M.D. 1956, Georgetown University

James Peter Murphy, *Associate Clinical Professor of Neurological Surgery*
B.S. 1935, College of St. Thomas; M.D. 1939, Yale University

Mary Diane Murphy, *Instructor in Child Health and Development*
B.S. 1967, Virginia Polytechnic Institute and State University; M.D. 1971, Medical College of Virginia of Virginia Commonwealth University

Francis James Murray, *Clinical Professor of Medicine*
B.S. 1936, University of Notre Dame; M.D. 1940, Cornell University

John Lee Murray, *Clinical Instructor in Radiology*
B.S. 1964, Bowling Green State University; M.S. 1973, California State University, San Diego

Charles Michael Myers, *Assistant Clinical Professor of Pathology*
B.S. 1966, University of Southern Mississippi; M.S. 1976, Georgia State University

Jay Douglas Myers, *Special Lecturer in Pathology*
B.S. 1972, Bucknell University

Ntinos Myrianthopoulos, *Associate Clinical Professor of Neurology*
B.S. 1952, George Washington University; M.S. 1954, Ph.D. 1957, University of Minnesota

Gurbux Hariram Nachnani, *Associate Clinical Professor of Medicine*
M.B., B.S. 1963, B J. Medical College, University of Poona, India

Issei Nakayama, *Visiting Professor of Pharmacology*
M.D. 1967, Nihom University, Japan

William Milton Narva, *Associate Clinical Professor of Dermatology*
B.A. 1952, Hofstra University; M.D. 1956, Yale University

Stephen Sanborn Nason, *Assistant Professor of Orthopaedic Surgery and of Child Health and Development*
M.D. 1967, Tulane Unversity

John Patrick Naughton, *Adjunct Professor of Medicine*
B.S. 1954, St. Louis University; M D. 1958, University of Oklahoma

Cheryl Marco Naulty, *Instructor in Child Health and Development*
B.A. 1968, University of Pennsylvania; M.D. 1972, Thomas Jefferson University

Bertel Nelson, *Clinical Professor of Medicine*
B.A. 1945, M.D. 1948, George Washington University

Fred Ritchie Trew Nelson, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1963, Johns Hopkins University; M.D. 1967, University of Maryland

Karin Becker Nelson, *Associate Clinical Professor of Neurology and of Child Health and Development*
M.D. 1957, University of Chicago

Warren James Nelson, *Associate Clinical Professor of Radiology*
B.S. 1948, University of Wisconsin; M.D. 1953, George Washington University

Daniel Arthur Neufeld, *Assistant Professor of Anatomy*
B.A. 1968, University of California, Los Angeles; M.A. 1972, California State University, Long Beach; Ph.D. 1975, Tulane University

Julius Salem Neviaser, *Clinical Professor of Orthopaedic Surgery*
B.A. 1923, M.D. 1927, George Washington University

Robert Jon Neviaser, *Professor of Orthopaedic Surgery*
B.A. 1958, Princeton University; M.D. 1962, Thomas Jefferson University

Thomas Jay Neviaser, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1962, University of Pennsylvania; M.D. 1966, George Washington University

Michael Arthur Newman, *Assistant Clinical Professor of Medicine*
B.A. 1963, Stanford University; M.D. 1969, University of Rochester

William Newman, *Professor of Pathology*
B.A. 1941, University of Wisconsin; M.D. 1946, New York University

Richard Austin Nicklas, *Assistant Clinical Professor of Medicine*
B.A. 1958, Cornell University; M.D. 1964, George Washington University

Thomas Peter Nigra, *Associate Clinical Professor of Dermatology*
B.A. 1963, St. Vincent College; M.D. 1967, University of Pennsylvania

John Herbert Niles, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1959, Allegheny College; M.D. 1963, Howard University

Allen Abbe Nimetz, *Assistant Clinical Professor of Medicine*
B.A. 1964, M.D. 1968, Cornell University

David Charles Nitsche, *Clinical Instructor in Pathology*
B.S. 1971, St. Bonaventure University

Raymon Augusta Noble, *Assistant Clinical Professor of Medicine*
B.S. 1962, Iowa Wesleyan College; M.D. 1966, University of Missouri

Thomas Douglas Noble, *Clinical Professor of Psychiatry and Behavior*
Sciences
B.A. 1924, M.B. 1927, M.D. 1936, University of Toronto

Joseph Anthony Noronha, *Clinical Instructor in Health Care Sciences*
M.D. 1966, Mysore Medical College, India

Henry Jason Norris, *Associate Clinical Professor of Pathology*
B.A. 1954, Linfield College; M.D. 1958, University of Rochester

Alexander Frederick North, Jr., *Associate Clinical Professor of Child Healt*
and Development
M.D 1956, Yale University

Joseph Dove Noshpitz, *Clinical Professor of Child Health and Development an*
of Psychiatry and Behavioral Sciences
B.A. 1943, M.D. 1945, University of Louisville

Robert Allen Nover, *Assistant Clinical Professor of Psychiatry and Behavior*
Sciences and of Child Health and Development
B.A. 1961, Union College, New York; M.D. 1965, State University of New York Upsta
Medical Center

John Francis Nowell, *Clinical Instructor in Ophthalmology*
B.S. 1954, M.D. 1956, University of Maryland

James William Oberman, *Special Lecturer in Child Health and Development*
M.D. 1949, Georgetown University

Allen Albert Oboler, *Assistant Clinical Professor of Medicine*
M.D. 1966, Wayne State University

Frank Martin Ochberg, *Associate Clinical Professor of Psychiatry and Beha*
ioral Sciences
B.A. 1961, Harvard University; M.D. 1965, Johns Hopkins University

Charles Winston Ochs, *Professor of Radiology*
B.A. 1954, Washington University; M.D. 1958, Tulane University; M.S. 1961, University
Rochester

Daniel Warne Ochsenschlager, *Assistant Professor of Child Health and Develo*
ment
B.S. 1964, Beloit College; M.D. 1968, Marquette University

Joseph Brian O'Connell, *Associate Professor of Medicine*
M.B., Ch.B., B.A.O. 1957, University College, Ireland

Yolanda Castillo Oertel, *Assistant Professor of Pathology*
M.D. 1965, University of Peru

Elizabeth Schowalter Ohlrich, *Assistant Research Professor of Child Health an*
Development
B.S. 1965, M.S. 1967, Ph.D. 1968, University of Wisconsin

Donald Ary O'Kieffe, *Associate Clinical Professor of Medicine*
B.A. 1960, M.D. 1964, Yale University

Andres Olaciregui, *Assistant Clinical Professor of Psychiatry and Behavior*
Sciences
B.S. 1958, Biffi-LaSalle University, Colombia; M.D. 1966, Universidad Javeriana, Colombi

Peter Dean Olch, *Professorial Lecturer in Pathology (History of Medicine)*
B.A. 1951, Pomona College; M.D. 1955, Johns Hopkins University

Corwin Anson Olds, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1947, U.S. Naval Academy; B.S. in M.E. 1955, M.S. in M.E. 1956, Naval Postgrad
School; M.D. 1972, George Washington University

Dennis Sophian O'Leary, *Associate Professor of Medicine and of Pathology (Laboratory Medicine); Dean for Clinical Affairs of the Medical Center*
B.A. 1960, Harvard University; M.D. 1964, Cornell University

Mary Ellen Phillips Oliveri, *Research Instructor in Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1971, Trinity College, District of Columbia; M.A. 1973, Ph.D. 1975, Johns Hopkins University

Bennett Olshaker, *Associate Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1943, M.D. 1945, George Washington University

Mark Daniel Olson, *Assistant Professor of Anatomy and of Ophthalmology*
B.A. 1968, Concordia College, Minnesota; M.S. 1970, Ph.D. 1973, University of North Dakota

LeRoy Robert Oly, *Special Lecturer in Radiology*

Ayub Khan Ommaya, *Clinical Professor of Neurological Surgery*
M.D. 1953, King Edward Medical College; M.A. 1960, Oxford University

John Francis O'Neill, *Assistant Clinical Professor of Ophthalmology*
B.S. 1952, Mount St. Mary's College, Maryland; M.D. 1956, Georgetown University

Beale Hibbs Ong, *Associate Clinical Professor of Child Health and Development*
B.A. 1955, M.D. 1959, George Washington University

Sean O'Reilly, *Professor of Neurology*
M.B. 1949, M.D. 1952, National University of Ireland

Ronald Julian Orleans, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1965, Franklin and Marshall College; M.D. 1969, George Washington University

Robert David Ornitz, *Assistant Research Professor of Radiology*
B.S. 1965, University of Wisconsin; M.D. 1971, University of Oklahoma

Louis Ortega, *Associate Professor of Pathology*
M.D. 1946, New York Medical College

Mario Ortega, *Assistant Clinical Professor of Child Health and Development*
M.D. 1965, University of San Carlos

F. Helmuth Orthner, *Assistant Professor of Clinical Engineering*
Dipl.Ing. 1966, Technical University of Munich; Ph.D. 1973, University of Pennsylvania

Morris Osborn, *Assistant Clinical Professor of Neurology*
M.D. 1963, University of Miami

Raphael Joseph Osheroff, *Assistant Clinical Professor of Medicine*
B.A. 1959, Columbia University; M.D. 1963, Creighton University

James Edward Ostrander, *Adjunct Instructor in Health Care Sciences*
M.D. 1975, University of the Pacific

Bernard Howard Ostrow, *Assistant Clinical Professor of Medicine*
B.A. 1944, Miami University; M.D. 1948, George Washington University

Neil Stuart Otchin, *Clinical Instructor in Medicine*
B.S. 1963, University of Florida; M.D. 1967, Duke University

Gilbert Ottenberg, *Assistant Clinical Professor of Urology*
B.A. 1922, M.A. 1924, M.D. 1928, George Washington University

Ronald Ottenberg, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1956, M.D. 1959, George Washington University

Lewis Antoine Ottenritter, *Assistant Clinical Professor of Orthopaedic Surgery*
B.S. 1957, Loyola College; M.D. 1961, University of Maryland

Kathleen Leinau Owens, *Clinical Instructor in Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1954, M.A. 1962, University of California, Berkeley; M.S.W. 1969, Howard University

Mark Norman Ozer, *Associate Research Professor of Child Health and Development*
B.A. 1953, Harvard University; M.D. 1957, Boston University

Thomas Padikal, *Assistant Professor of Radiology (Radiation Physics)*
B.S. 1967, M.S. 1969, Kerala University, India; M.S. 1971, Cleveland State University; M.S. 1973, Ph.D. 1975, University of Cincinnati

Russel Smith Page, Jr., *Associate Clinical Professor of Otolaryngology*
B.A. 1936, Dartmouth College; M.D. 1940, University of Vermont

Chang Hum Paik, *Assistant Research Professor of Radiology (Nuclear Medicine)*
B.S. 1963, Inha Institute of Technology; Ph.D. 1972, University of California, Santa Cruz

Henry Alan Painter, *Special Lecturer in Pathology*

Barton Pakull, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1957, City University of New York, City College; M.D. 1961, State University of New York Upstate Medical Center

Richard Emery Palmer, *Clinical Professor of Pathology*
B.A., M.D. 1944, George Washington University

Richard Roy Palmer, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1966, Harvard University; M.D. 1971, Georgetown University

Garsutis Kazimieras Palys, *Adjunct Instructor in Psychiatry and Behavioral Sciences*
B.S. 1969, St. John's University; M.D. 1973, State University of New York at Buffalo

John Pan, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1966, University of Notre Dame; M.D. 1970, George Washington University

Stephen Stavros Pappas, *Assistant Clinical Professor of Ophthalmology*
B.S. 1952, M.D. 1956, George Washington University

Edwin Pearson Parker III, *Clinical Professor of Medicine*
B.S. 1939, M.D. 1942, University of Virginia

Dee Rich Parkinson, *Associate Clinical Professor of Pathology*
M.D. 1943, George Washington University

Marshall Miller Parks, *Clinical Professor of Ophthalmology and of Child Health and Development*
B.A. 1939, Illinois College; M.D. 1943, St. Louis University

Alvin Edward Parrish, *Professor of Medicine*
M.D. 1945, George Washington University

Robert Harold Parrott, *Professor of Child Health and Development*
M.D. 1949, Georgetown University

Diane Brickley Parsons, *Assistant Research Professor of Orthopaedic Surgery*
B.A. 1967, Newton College; Ph.D. 1972, Boston University

Robert Wilton Parsons, *Associate Clinical Professor of Surgery*
Ph.B. 1949, University of Chicago; M.D. 1964, Washington University

Michael Allen Paske, *Special Lecturer in Pathology*
B.S. 1972, Baker University

Harold Irwin Passes, *Assistant Clinical Professor of Medicine*
M.B., B.S. 1949, University of London

Daniel Young Patterson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, M.D. 1966, University of Kentucky; M.P.H. 1970, Johns Hopkins University

Robert Harry Patterson, *Assistant Professor of Pathology*
B.A. 1965, Bridgewater College; M.D. 1969, George Washington University

Geraldine Winnie Paul, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1953, University of Richmond; M.D. 1960, Medical College of Virginia of Virginia Commonwealth University

Leonard Gregory Pawlson, *Assistant Professor of Health Care Sciences and of Medicine*
B.S. 1965, Pennsylvania State University; M.D. 1969, University of Pittsburgh

Beneta Jane Peacock, *Assistant Professor of Child Health and Development*
B.A. 1946, Mary Baldwin College; M.D. 1965, New York University

Jed Williams Pearson, Jr., *Clinical Professor of Obstetrics and Gynecology*
B.A. 1934, DePauw University; M.D. 1938, Indiana University at Indianapolis

Frank Alan Pedreira, *Assistant Clinical Professor of Child Health and Development*
B.A. 1959, Rutgers—The State University; M.D. 1963, State University of New York Upstate Medical Center

Paul Thomas Peebles, *Assistant Clinical Professor of Child Health and Development*
B.S. 1963, John Carroll University; M.D. 1967, Case Western Reserve University

Roger Peele, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1955, University of North Carolina; M.D. 1960, University of Tennessee

Juan Carlos Penhos, *Associate Professorial Lecturer in Medicine*
M.D. 1942, University of Buenos Aires

John Calvin Perkins, *Clinical Instructor in Medicine*
B.A. 1956, M.D. 1960, Harvard University

Walter Reams Perkins, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1957, University of Richmond; M.D. 1961, Medical College of Virginia of Virginia Commonwealth University

Stanley Morton Perl, *Clinical Instructor in Radiology*
B.A. 1960, Brown University; M.D. 1964, University of Pittsburgh

Elliott Perlin, *Assistant Professor of Medicine*
B.S. 1957, George Washington University; M.D. 1961, Thomas Jefferson University

Seymour Perlin, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1947, Princeton University; M.D. 1950, Columbia University

Louis Robert Perna, *Assistant Clinical Professor of Surgery*
B.A. 1950, M.D. 1953, George Washington University

Louis Edward Perraut, *Clinical Instructor in Ophthalmology*
B.A. 1945, University of Kentucky; M.D. 1946, University of Louisville

Lowell Wesley Perry, *Associate Professor of Child Health and Development*
M.D. 1960, Temple University

Danna Bowers Peterson, *Assistant Professor of Anesthesiology*
M.B., Ch.B. 1967, University of Edinburgh

Kent Albrecht Peterson, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1956, M.D. 1959, George Washington University

Leonard Theodore Peterson, *Clinical Professor of Orthopaedic Surgery*
B.A., B.S. 1928, M.D. 1931, University of Minnesota

William Frank Peterson, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1946, New York Medical College

Stephen Donohoe Pett, *Adjunct Instructor in Surgery*
B.S. 1967, Seton Hall University; M.D. 1971, George Washington University

Michael Phillips, *Assistant Clinical Professor of Medicine*
B.A. 1962, City University of New York, Brooklyn College; M.D. 1967, State University of New York at Buffalo

Steve Richard Pieczenik, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, M.D. 1968, Cornell University

Thomas Eugene Piemme, *Professor of Health Care Sciences and of Medicine*
B.S. 1954, M.D. 1958, University of Pittsburgh

Lawrence Pierce, *Professor of Medicine*
M.D. 1955, Georgetown University

Roger James Pierce, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1964, George Washington University; M.D. 1968, Georgetown University

Howard Clemeth Pierpont, *Associate Professor of Surgery*
B.A. 1939, Marietta College; M.D., C.M. 1943, McGill University

Dean Lawrence Pierson, *Clinical Instructor in Dermatology*
B.S. 1962, M.P.H. 1963, University of California, Berkeley; M.D. 1967, Temple University

Esther Anita Garner Pinder, *Clinical Instructor in Child Health and Development*
B.S. 1965, City University of New York, City College; M.D. 1969, Howard University

Hanna Zulauf Pipberger, *Assistant Research Professor of Clinical Engineering*
B.A. 1942, Teachers College, Switzerland

Hubert Vincent Pipberger, *Professor of Clinical Engineering and of Medicine*
B.A. 1938, Deutsches Kollege, Germany; M.D. 1951, Rheinische Friedrich Wilhelms University, Germany

Joseph Michael Pisani, *Associate Clinical Professor of Medicine*
B.A. 1938, Fordham University; M.D. 1942, New York University

Lucius Loring Pitts II, *Assistant Clinical Professor of Pathology*
B.S. 1959, Georgia Institute of Technology; Ph.D. 1976, Wake Forest University

Mark Melvin Platt, *Assistant Professor of Neurology and of Child Health and Development*
B.A. 1962, M.D. 1966, University of Vermont

Harold Plotsky, *Clinical Instructor in Child Health and Development and in Psychiatry and Behavioral Sciences*
Ph.B. 1945, B.S. 1947, M.D. 1949, University of Chicago

Frederick William Plugge IV, *Professor of Surgery*
B.A. 1953, University of Pennsylvania; M.D. 1957, University of Maryland

George Nicholas Polis, *Assistant Clinical Professor of Medicine*
B.S. 1951, Georgetown University; M.D. 1955, University of Maryland

Donald David Pollock, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Amherst College; M.D. 1964, Albany Medical College of Union University

Robert Smallwood Poole, *Assistant Clinical Professor of Medicine*
B.A. 1950, M.D. 1953, George Washington University

Robert Baruch Posner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, M.S. 1963, University of Arizona; M.D. 1967, University of California, Los Angeles; M.S. in Hyg. 1969, Harvard University

Jerrold Morton Post, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1956, M.D. 1960, Yale University

Lynne Frances Brod Potempa, *Clinical Instructor in Pathology*
B.M.S. 1964, University of Missouri

Barry Potter, *Assistant Professor of Radiology and of Child Health and Development*
B.A. 1963, City University of New York, Brooklyn College; M.D. 1967, State University of New York Downstate Medical Center

Michael Francis Pratt, *Clinical Instructor in Pathology (Laboratory Medicine)*
B.S. 1972, University of Maryland

Michael Lee Pratt, *Clinical Instructor in Pathology (Blood Banking)*
B.S. 1966, University of Iowa

James Louis Preston, *Special Lecturer in Health Care Sciences*

Neel Jack Price, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1939, B.S. 1940, M.D. 1942, University of Oklahoma

Robert Henry Price, *Special Lecturer in Health Care Sciences*

Milo Prodanovich, *Assistant Clinical Professor of Pathology (Clinical Chemistry)*
B.S. 1965, M.A. 1968, California State University, San Diego

Louis Quain Pugsley, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1954, Hamilton College; M.D. 1958, Cornell University

Jose Rafael Puig, *Adjunct Associate Professor of Child Health and Development*
M.D. 1950, Santo Domingo University, Dominican Republic

Robert Earl Pumphrey, Jr., *Associate Clinical Professor of Otolaryngology*
B.S. 1955, Denison University; M.D. 1959, Ohio State University

Jerome Stuart Putnam, *Assistant Professor of Medicine*
B.A. 1965, Dartmouth College; M.D. 1969, Tufts University

James Tindal Quattlebaum, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1955, University of South Carolina; M.D. 1956, Medical University of South Carolina; M.A. 1961, Columbia University

Ghulam Rasul Qureshi, *Assistant Clinical Professor of Pathology*
M.B., B.S. 1970, K.E. Medical College, Pakistan

Boris Rabkin, *Assistant Clinical Professor of Medicine*
B.A. 1939, New York University; M.D. 1943, George Washington University

Anis Racy, *Assistant Professor of Neurology*
B.S. 1967, M.D. 1971, American University of Beirut

Luis Carlos Radice, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1957, University of Buenos Aires

Thomas Justin Radley, *Assistant Clinical Professor of Orthopaedic Surgery*
M.D. 1942, University of Cincinnati

Devanhalli Ramaswamy, *Clinical Instructor in Medicine*
M.D. 1961, University of Mysore

James North Ramey, *Assistant Clinical Professor of Medicine*
B.A. 1964, Amherst College; M.D. 1968, Columbia University

Judson Graves Randolph, *Professor of Surgery and of Child Health and Devel*
opment
B.A. 1950, M.D. 1953, Vanderbilt University

Joseph Eugene Rankin, *Professor of Psychiatry and Behavioral Sciences*
B.S. 1942, Catholic University of America; M.D. 1946, George Washington University

Khosrow Rastgar, *Adjunct Instructor in Pathology*
B.S. 1964, M.D. 1970, Pahlavi University, Iran

Harold Elton Ratcliffe, *Professor of Medicine*
B.A. 1935, M.D. 1939, Tulane University

Richard Albert Ratner, *Assistant Clinical Professor of Psychiatry and Behav*
ioral Sciences and of Medicine
B.A. 1962, University of Chicago; M.D. 1966, University of Pennsylvania

Kent Ravenscroft, Jr., *Assistant Professor of Psychiatry and Behavioral Science*
and of Child Health and Development
B.A. 1962, Yale University; M.D. 1966, Harvard University

Sheila Eileen Hamburg Raviv, *Assistant Professorial Lecturer in Health Car*
Sciences
B.A. 1964, Indiana University

Lawrence William Raymond, *Assistant Professor of Medicine*
B.C.E. 1956, Manhattan College; M.S. 1957, Harvard University; M.D. 1964, Cornell University

James Lamar Read, *Assistant Clinical Professor of Psychiatry and Behavioral*
Sciences
B.S. 1949, M.D. 1953, University of Maryland

Richard Charney Reba, *Professor of Radiology (Nuclear Medicine) and of*
Medicine
M.D. 1957, University of Maryland

Maurice Merrick Reeder, *Clinical Professor of Radiology*
B.A. 1954, Loyola College; M.D. 1958, University of Maryland

Anne Hollis Reese, *Clinical Instructor in Psychiatry and Behavioral Sciences*
(Social Work)
B.A. 1959, Case Western Reserve University; M.S. 1962, Columbia University

Thomas Sargent Reese, *Professorial Lecturer in Anatomy*
B.A. 1957, Harvard University; M.D. 1962, Columbia University

Robert Michael Regan, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1957, Hamilton College; M.D. 1964, George Washington University

Melvin Reich, *Associate Professor of Microbiology*
B.S. 1953, City University of New York, City College; M.S. 1957, Ph.D. 1960, Rutgers—The
State University

David Reiss, *Professor of Psychiatry and Behavioral Sciences and of Medicine*
B.A. 1958, M.D. 1962, Harvard University

Marilyn Lewis Renfield, *Assistant Clinical Professor of Child Health and De*
velopment
B.A. 1961, Duke University; M.D. 1965, George Washington University

Clarence Arnold Renschler, *Assistant Clinical Professor of Child Health and*
Development
B.A. 1964, Walla Walla College; M.D. 1968, Loma Linda University

Philip Louis Repetto, Jr., *Assistant Clinical Professor of Dermatology*
B.A. 1951, M.D. 1955, University of Pennsylvania

Harvey Resnik, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, State University of New York at Buffalo; M.D. 1955, Columbia University

Frederick Turner Reuter, *Clinical Professor of Urology*
M.D. 1944, George Washington University

Mildred Myers Reynolds, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences (Social Work)*
B.S. in Ed. 1952, Indiana Central College; M.S. 1955, Butler University; M.S.W. 1969, Catholic University of America

Thomas Dewitt Reynolds, *Associate Clinical Professor of Psychiatry and Behavioral Sciences (Experimental Psychiatry)*
B.A. 1949, M.D. 1955, University of Chicago

Richard Coleman Rhame, *Assistant Clinical Professor of Urology*
B.A. 1950, Princeton University; M.D. 1954, George Washington University

Jack Jacob Rheingold, *Clinical Professor of Medicine*
B.A. 1936, University of Alabama; M.B. 1940, M.D. 1941, University of Cincinnati

Harvey William Rice, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1955, West Virginia Wesleyan College; M.D. 1959, University of Cincinnati

Norman Minner Rich, *Associate Professor of Surgery*
B.A. 1956, M.D. 1960, Stanford University

Calvin Maynard Richardson, *Clinical Instructor in Radiology*

Henry Burtt Richardson, Jr., *Associate Professor of Child Health and Development*
B.A. 1956, Haverford College; M.D. 1960, Temple University

Sanford Norman Richman, *Assistant Clinical Professor of Medicine*
B.S. 1960, University of Georgia; M.D. 1964, Medical College of Georgia



Ruth Stone Richmond, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1937, Goucher College; M.S.W. 1969, Catholic University of America

LeRoy Riddick, *Assistant Clinical Professor of Pathology (Forensic)*
B.A. 1954, Princeton University; M.A. 1965, Columbia University; M.D. 1969, College of Medicine and Dentistry of New Jersey

Rebecca Eisenberg Rieger, *Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1940, City University of New York, Hunter College; M.A. 1941, Columbia University; M.A. 1952, Ph.D. 1960, Catholic University of America

Charles Andrew Rigg, *Associate Professor of Child Health and Development*
M.B., B.Surg. 1951, University of Sydney, Australia; M.R.A.C.P. 1955, F.R.A.C.P. 1968, Royal Australian College of Physicians

Rita Coronado Rigor, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1965, University of Santo Tomas, Philippines

Jorge Carlos Rios, *Professor of Medicine*
M.D. 1959, University of Buenos Aires

Surendra Ramchandra Rishi, *Clinical Instructor in Medicine*
M.B., B.S. 1953, M.D. 1957, University of Bombay

Nancy Pritchard Risseeuw, *Special Lecturer in Pathology*
B.S. 1972, Auburn University

Gussey Rivers, *Special Lecturer in Health Care Sciences*

Hugo Victor Rizzoli, *Professor of Neurological Surgery*
B.A. 1936, M.D. 1940, Johns Hopkins University

Alice Jeannette Roach, *Assistant Professor of Radiology*
B.A. 1965, North Texas State University; M.D. 1971, University of Texas Center for Health Sciences at Dallas

Mary Louise Robbins, *Professor of Microbiology*
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University

Morton Jay Roberts, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1964, Franklin and Marshall College; M.D. 1968, George Washington University

William Clifford Roberts, *Professorial Lecturer in Medicine (Cardiology) and Pathology (Cardiology)*
B.A. 1954, Southern Methodist University; M.D. 1958, Emory University

Carolyn Bauer Robinowitz, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1959, Wellesley College; M.D. 1964, Washington University

Albert Irving Robins, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1937, George Washington University; M.D. 1941, Georgetown University

Douglas Neil Robins, *Assistant Clinical Professor of Dermatology and Medicine*
B.S. 1965, Washington and Lee University; M.D. 1969, George Washington University

John David Robinson, *Visiting Lecturer in Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1968, M.A. 1969, Ph.D. 1971, University of Texas

Joseph Daniel Robinson, *Assistant Clinical Professor of Medicine*
B.A. 1965, Princeton University; M.D. 1970, Yale University

Luther Dabney Robinson, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1943, Virginia State College; M.D. 1946, Meharry Medical College

Patsy June Robinson, *Assistant Professor of Pathology (Microbiology)*
B.S. 1954, Louisiana State University; M.S. 1964, Michigan State University

S. David Rockoff, *Professor of Radiology*
B.A. 1951, Syracuse University; M.D. 1955, Albany Medical College of Union University; M.S. 1961, University of Pennsylvania

Harold Irvin Rodman, *Clinical Instructor in Ophthalmology*
B.A. 1952, Johns Hopkins University; M.D. 1956, University of Maryland

Orlando Gilbert Rodman, *Associate Clinical Professor of Dermatology*
B.A. 1961, Valparaiso University; M.D. 1965, Howard University

Chalon Rodriguez, *Associate Clinical Professor of Urology*
M.D. 1943, University of Havana, Cuba

Edmond Rodriguez, *Clinical Instructor in Medicine*
M.D. 1948, University of Havana, Cuba

William Julio Rodriguez, *Assistant Professor of Child Health and Development*
B.S. 1963, M.D. 1967, Ph.D. 1975, Georgetown University

Joseph Hyram Roe, Jr., *Assistant Clinical Professor of Pathology*
B.A. 1950, Yale University; M.A. 1951, George Washington University; M.D. 1956, Johns Hopkins University; M.L.S. 1962, University of California, Los Angeles

Gary Lee Roecker, *Special Lecturer in Pathology*
B.S. 1972, Kent State University

Gerald David Rogell, *Assistant Clinical Professor of Ophthalmology*
B.A. 1963, M.D. 1967, Harvard University

Charles Clanton Rogers, *Professor of Radiology (Radiation Therapy)*
B.A. 1956, Maryville College, Tennessee; M.D. 1960, University of Arkansas

Richard Allan Rogers, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1941, University of Washington; M.D. 1944, Northwestern University

Senta Stephanie Rogers, *Assistant Research Professor of Medical and Public Affairs*
B.A. 1945, City University of New York, Hunter College; M.S. 1948, Purdue University; Ph.D. 1967, George Washington University

Manouchehr Rokni, *Clinical Instructor in Child Health and Development*
M.D. 1960, University of Tehran

James Holt Rollen, *Special Lecturer in Pathology*

Frank Edward Rollins, *Special Lecturer in Health Care Sciences*

Monroe James Romansky, *Professor of Medicine*
B.A. 1933, University of Maine at Orono; M.D. 1937, University of Rochester

Walter Joseph Romejko, *Assistant Clinical Professor of Ophthalmology*
B.S. 1934, St. Joseph's College, Pennsylvania; M.D. 1938, Thomas Jefferson University

Cheryl Marie Roock, *Clinical Instructor in Pathology (Laboratory Medicine)*
B.A. 1967, State University of New York at Oswego

Joseph Anthony Rosario, *Special Lecturer in Pathology*
B.A. 1972, Northeastern Illinois University

Morton Harold Rose, *Assistant Clinical Professor of Medicine*
M.D. 1942, George Washington University

Robert Earl Rose, *Research Instructor in Medicine*
B.S. 1961, Boston University; M.S. 1967, University of Iowa

Arthur Bernard Rosebaum, *Clinical Professor of Medicine and of Health Care Sciences*
B.S. 1931, City University of New York, City College; M.D. 1935, New York University

Kenneth Neil Rosenbaum, *Clinical Instructor in Child Health and Developmen*
B.S. 1968, M.D. 1971, University of Louisville

Meyer Rosenbaum, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1942, M.D. 1944, Tulane University

Morris Hirsh Rosenberg, *Associate Clinical Professor of Medicine*
B.A. 1938, M.D. 1941, George Washington University

Stephen Rosenblum, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Amherst College; M.D. 1967, Columbia University

Marvin Rosenstein, *Assistant Clinical Professor of Radiology (Radiation Physics*
B.S. 1961, Ph.D. 1971, University of Maryland; M.S. 1966, Rensselaer Polytechnic Institute

Douglas Roy Rosing, *Associate Clinical Professor of Medicine*
B.A. 1963, Princeton University; M.D. 1967, State University of New York at Buffalo

Richard Harold Ross, *Associate Research Professor of Medical and Public Affairs*
B.A. 1955, M.B.A. 1963, George Washington University

Sydney Ross, *Clinical Professor of Child Health and Development*
B.S. 1940, M.D. 1943, Harvard University

Leonard Earl Rothkoff, *Clinical Instructor in Ophthalmology*
M.D. 1965, Yeshiva University

Irwin Winn Rovner, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1948, M.D. 1953, University of Iowa

Alan Hardy Rowberg, *Assistant Research Professor of Medicine*
B.S. 1966, Pacific Lutheran University; M.D. 1970, University of Washington; M.S. 1974, Johns Hopkins University

Lawrence Richard Rubel, *Assistant Clinical Professor of Pathology*
B.S. 1958, University of Pennsylvania; M.D. 1965, University of Illinois

Norman Hartley Rubenstein, *Assistant Clinical Professor of Medicine*
M.D. 1950, George Washington University

Jesse Gallant Rubin, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1953, Franklin and Marshall College; M.D. 1957, Yale University

Lily Ruckstuhl, *Clinical Instructor in Medicine*
M.D. 1954, University of Geneva

Cesar Rudzki, *Assistant Clinical Professor of Medicine*
M.D. 1961, University of Buenos Aires; M.P.H. 1969, Johns Hopkins University

Marshall deGraffenried Ruffin, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1932, University of Virginia; M.D. 1936, Harvard University

Daniel August Ruge, *Assistant Professorial Lecturer in Neurological Surgery*
B.A. 1939, North Central College; M.D. 1945, M.S. 1949, Ph.D. 1961, Northwestern University

Arthur Ruskin, *Associate Clinical Professor of Medicine*
B.S. 1932, City University of New York, City College; M.D. 1936, New York University

Joseph Anthony Russotto, *Assistant Clinical Professor of Radiology*
B.A. 1954, American International College; M.D. 1958, Georgetown University; M.S. 1961, University of Rochester

Urs Eugene Ruttimann, *Assistant Professor of Clinical Engineering*
M.S. in E.E. 1966, Swiss Federal Institute of Technology; Ph.D. 1972, University of Pennsylvania

Waclaw Janusz Rzeszotarski, *Assistant Research Professor of Radiology (Nuclear Medicine)*
M.Sc. 1959, Institute of Technology, Poland; Ph.D. 1964, Polish Academy of Sciences

Michael George Saalouke, *Assistant Professor of Child Health and Development*
M.D. 1969, Damascus University, Syria

Joseph Aziz Sabri, *Associate Clinical Professor of Otolaryngology*
B.A. 1941, M.D. 1946, American University of Beirut

Fernando Sacasa, *Assistant Clinical Professor of Surgery (Oral Surgery)*
D.D.S. 1935, Georgetown University

Nedzib Sacirbey, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1955, University of Zagreb, Yugoslavia

Josiah Sacks, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1951, Providence College; M.D. 1955, Tufts University

Harold Charles Sadin, *Associate Clinical Professor of Medicine*
B.A. 1948, Hamilton College; M.D. 1952, Albany Medical College of Union University

William James Sadlack, *Adjunct Instructor in Orthopaedic Surgery*
B.S. 1964, St. Peter's College; M.D. 1971, St. Louis University

Armando Saenz, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, University of Texas at El Paso; M.D. 1963, University of Texas Southwestern Medical School at Dallas

Alan Robert Sager, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1964, Rutgers—The State University; M.D. 1969, Boston University

John Harmer Sager, *Clinical Instructor in Surgery*
B.A. 1948, Princeton University; M.D. 1952, George Washington University

Nirmal Saini, *Associate Professor of Pathology*
M.B., B.S. 1957, King Edward Medical College, India

Hernando Salcedo, *Assistant Clinical Professor of Urology*
B.S. 1955, University College, Colombia; M.D. 1962, Javeriana University, Colombia

Jose Rodofo Salcedo, *Assistant Professor of Child Health and Development*
M.D. 1970, Guadalajara State University, Mexico

Allen Johannes Saleri, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1971, University of Istanbul

Stanton Ethan Samenow, *Clinical Instructor in Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1963, Yale University; M.A. 1964, Ph.D. 1968, University of Michigan

Melvin Wesley Sandmeyer, Jr., *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1950, M.D. 1953, George Washington University

Lawrence Sank, *Assistant Professor of Health Care Sciences and of Psychiatry and Behavioral Sciences*
B.A. 1968, Brandeis University; M.S. 1970, Ph.D. 1972, Rutgers—The State University

Philip Jay Santora, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.S. 1966, Le Moyne College; M.D. 1970, St. Louis University

Thomas Stone Sappington, *Clinical Professor of Medicine*
B.A. 1937, M.D. 1941, Harvard University

Rajindra Kumar Sarin, *Associate Clinical Professor of Medicine*
M.B., B.S. 1962, Panjab University, India

David Satinsky, *Assistant Clinical Professor of Neurology*
B.A. 1960, M.D. 1964, University of Pennsylvania

Bertram Jacob Lyons Sauerbrunn, *Professor of Radiology (Nuclear Medicine*
B.S. 1936, Lafayette College; M.D. 1940, Albany Medical College of Union University

Robert Clarence Saunders, *Assistant Professor of Medicine*
B.A. 1962, University of Washington; M.D. 1967, George Washington University

Charles Joseph Savarese, Jr., *Assistant Professorial Lecturer in Health Car*
Sciences
B.A. 1942, University of North Carolina; M.D. 1950, George Washington University

Melchior Savarese, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1946, Yale University; M.D. 1949, Georgetown University

Sumner Alan Savitz, *Assistant Clinical Professor of Psychiatry and Behavioral*
Sciences
B.S. 1957, Massachusetts Institute of Technology; M.D. 1961, Tufts University

Raymond Scalettar, *Associate Clinical Professor of Medicine*
B.A. 1950, Columbia University; M.D. 1954, State University of New York Downstate Medical
Center

Giuseppe Scarcella, *Associate Clinical Professor of Psychiatry and Behavioral*
Sciences
M.D. 1947, University of Bologna, Italy

Geraldine Schaeffer, *Assistant Clinical Professor of Psychiatry and Behavioral*
Sciences
B.A. 1954, University of Pennsylvania; M.D. 1958, Medical College of Pennsylvania

Leslie Schaffer, *Assistant Clinical Professor of Psychiatry and Behavioral Sci*
ences
M.B. 1942, M.B., Ch.B. 1948, University of London

David Edward Scharff, *Assistant Clinical Professor of Psychiatry and Behav*
ioral Sciences
B.A. 1962, Yale University; M.D. 1966, Harvard University

Jerrold Francis Schaumleffel, *Special Lecturer in Pathology*

Alan Neil Schechter, *Professorial Lecturer in Biochemistry*
B.A. 1959, Cornell University; M.D. 1963, Columbia University

Geraldine Poppa Schechter, *Associate Professor of Medicine*
B.A. 1959, Vassar College; M.D. 1963, Columbia University

Heinz Hanns Eduard Scheidemandel, *Clinical Instructor in Otolaryngology*
M.D. 1955, University of Erlangen, Germany

Irwin Scher, *Assistant Professor of Medicine*
B.S. 1962, State University of New York at Albany; M.D. 1966, Yeshiva University

Paul Schlein, *Assistant Clinical Professor of Medicine*
B.A. 1952, M.D. 1956, Cornell University

Theodore Joseph Schmitz III, *Special Lecturer in Radiology*

Charles Isaac Schneiderman, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1964, University of Michigan; M.D. 1968, George Washington University

Richard Schoenfeld, *Assistant Clinical Professor of Medicine*
B.S. 1954, University of Wisconsin; M.D. 1958, State University of New York Upstate Medical
Center

Robert Charles Schoening, *Special Lecturer in Pathology*

James Anthony Schoettler, *Assistant Clinical Professor of Psychiatry and Be*
havioral Sciences
B.A. 1953, California State University, Fresno; M.D. 1957, Johns Hopkins University

George Jerome Schonholtz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1950, New York University; M.D. 1954, State University of New York Downstate Medical Center

Marianne Schuelein, *Special Lecturer in Child Health and Development*
B.A. 1955, Wellesley College; M.D. 1959, New York University

Carol Ann Brimberg Schulman, *Clinical Instructor in Child Health and Development*
B.A. 1966, Radcliffe College; M.D. 1970, Georgetown University

Cyril Augustus Schulman, *Associate Clinical Professor of Medicine*
B.S. 1938, M.D. 1942, George Washington University

Joseph Daniel Schulman, *Professor of Obstetrics and Gynecology*
B.A. 1961, City University of New York, Brooklyn College; M.D. 1966, Harvard University

Charles John Schulte III, *Special Lecturer in Child Health and Development*
B.A. 1958, Johns Hopkins University; M.D. 1962, Albany Medical College of Union University

Morris Aaron Schultz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1955, Rice University; M.D. 1959, University of Texas Medical Branch at Galveston

Forrest Veil Schumacher, *Assistant Clinical Professor of Radiology*
B.A. 1942, Lehigh University; M.D. 1945, University of Pennsylvania

Harold Robert Schumacher, *Associate Clinical Professor of Pathology*
B.S. 1951, M.D. 1955, University of Cincinnati

Maxine Ann Schurter, *Associate Clinical Professor of Surgery*
B.A. 1944, Pomona College; M.D. 1951, George Washington University

Dean Schuyler, *Special Lecturer in Psychiatry and Behavioral Sciences*
B.A. 1963, M.D. 1967, New York University

Harry Alfred Schwamm, *Clinical Professor of Pathology*
B.A. 1950, New York University; M.D. 1957, University of Zurich

David Taylor Schwartz, *Assistant Clinical Professor of Urology*
B.A. 1959, Harvard University; M.D. 1963, Columbia University

Don Elliot Schwartz, *Assistant Clinical Professor of Ophthalmology*
B.S. 1963, City University of New York, Queens College; M.D. 1967, Yeshiva University

Harvey Albert Schwartz, *Assistant Clinical Professor of Medicine*
B.S. 1963, City University of New York, Queens College; M.D. 1967, State University of New York at Buffalo

Richard Harvey Schwartz, *Clinical Instructor in Child Health and Development*
B.A. 1960, George Washington University; M.D. 1965, Georgetown University

Stanley Alvin Schwartz, *Assistant Clinical Professor of Medicine*
B.S. 1955, Alfred University; M.D. 1959, Albany Medical College of Union University

Noel Asher Schweig, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, Wesleyan University; M.D. 1956, Duke University

Agnes Eva Schweitzer, *Assistant Clinical Professor of Child Health and Development*
B.S. 1955, M.D., C.M. 1959, McGill University

Lewis Pennington Scott III, *Professor of Child Health and Development*
M.D. 1954, Thomas Jefferson University

Richard Nathaniel Scott, *Clinical Instructor in Surgery*
B.A. 1963, Lincoln University; M.D. 1967, Howard University

Robert Coleman Eugene Scott, *Special Lecturer in Pathology*

Samuel Scott, Jr., *Assistant Professor of Medicine*
B.S. 1966, M.D. 1970, George Washington University

Winfield Harker Scott, *Associate Professor of Medicine and of Psychiatry and Behavioral Sciences; Assistant Dean for Education and Director of Education of the Medical Center*
B.S. 1954, M.S. 1955, Ph.D. 1958, Pennsylvania State University

Joan Rice Sealy, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, University of Chicago; M.D. 1968, George Washington University

Henry Francis Sears II, *Assistant Clinical Professor of Surgery*
B.A. 1962, University of Pennsylvania; M.D. 1966, Columbia University

Lewis Hiram Seaton II, *Associate Professor of Ophthalmology*
B.S. 1952, M.D. 1955, University of Pittsburgh

Amiel Segal, *Assistant Clinical Professor of Medicine (Hematology-Oncology)*
B.A. 1962, Harvard University, M.D. 1966, University of Pennsylvania

Ira Seiler, *Special Lecturer in Child Health and Development*
M.D. 1956, State University of New York Downstate Medical Center

David Murray Seitzman, *Assistant Clinical Professor of Urology*
B.A. 1951, M.D. 1954, Vanderbilt University

Alvin Seltzer, *Assistant Clinical Professor of Medicine*
B.S. 1937, M.D. 1941, University of Illinois

Hrant Samuel Semerjian, *Associate Clinical Professor of Urology*
B.S. 1962, M.D. 1965, American University of Beirut

Marsha Serre, *Clinical Instructor in Pathology*
B.S. 1968, Ohio University

John Louis Sever, *Professorial Lecturer in Child Health and Development and in Obstetrics and Gynecology*
M.D., Ph.D. 1957, Northwestern University

John Christopher Seymour, *Assistant Clinical Professor of Medicine*
B.A. 1961, Brown University; M.D. 1965, George Washington University

Michael John Shaffer, *Assistant Professor of Anesthesiology*
B.S. in E.E. 1949, University of Leeds; M.S. in E.E. 1974, George Washington University

Mohammad Shahvari, *Assistant Professor of Anesthesiology and Assistant Research Professor of Pharmacology*
M.D. 1968, Pahlavi University, Iran; M.S. 1973, Temple University

Robert Michael Shannon, *Assistant Professor of Health Care Sciences*
M.D. 1971, University of Maryland

Jay Robert Shapiro, *Associate Clinical Professor of Medicine*
B.S. 1953, Franklin and Marshall College; M.D. 1957, Boston University

Joan Shapiro, *Instructor in Health Care Sciences*
B.A. 1971, University of Wisconsin; M.A. 1973, Ph.D. 1975, University of Connecticut

Philip Shapiro, *Assistant Research Professor of Radiology*
B.S. 1948, City University of New York, Brooklyn College; Ph.D. 1953, State University of Iowa

Robert David Shapiro, *Assistant Clinical Professor of Surgery (Oral Surgery)*
B.S. 1960, D.D.S. 1962, Case Western Reserve University

Roger Lee Shapiro, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1947, M.D. 1949, University of Chicago

Stephen Robert Shapiro, *Assistant Professor of Child Health and Development*
B.S. 1963, Tufts University; M.D. 1967, New York University

Alan Bruce Shauer, *Assistant Clinical Professor of Medicine*
B.A. 1963, New York University; M.D. 1968, University of Bologna

Benjamin Alfonza Shaver, *Assistant Clinical Professor of Child Health and Development*
B.S. 1952, Massachusetts Institute of Technology; M.D 1956, Yale University

Samuel Hazen Shea, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1933, M.D. 1936, George Washington University

John Newcomb Sheagren, *Professor of Medicine*
B.A. 1957, Carleton College; M.D. 1962, Columbia University

Robert Shearin, *Assistant Clinical Professor of Child Health and Development*
B.S. 1964, North Carolina State University at Raleigh; M.D. 1968, University of North Carolina

Michael Mendel Shefferman, *Assistant Clinical Professor of Medicine*
B.A. 1958, Johns Hopkins University; M.D. 1962, University of Maryland

Joseph Bart Sheffery, *Professorial Lecturer in Obstetrics and Gynecology*
M.D. 1937, Georgetown University

Samuel Ainslie Shelburne, Jr., *Professor of Neurology and of Child Health and Development*
B.A. 1956, Princeton University; M.D. 1960, University of Texas Southwestern Medical School

Joseph Lee Sheridan, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1939, Indiana University at Bloomington; M.D. 1943, Indiana University at Indianapolis

Barbara Ensfield Sherwin, *Assistant Clinical Professor of Medicine*
B.S. 1959, Antioch College; M.D. 1967, George Washington University

Sharadchandra Shinde, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1954, M.B., B.S. 1960, University of Bombay

Jane Louise Shirey, *Special Lecturer in Pathology*

John Arthur Shive, *Special Lecturer in Radiology*

Paul Edgar Shorb, Jr., *Professor of Surgery*
B.A. 1951, Williams College; M.D. 1955, Johns Hopkins University

Irwin Shuman, *Assistant Clinical Professor of Urology*
B.S. 1955, George Washington University; M.D. 1959, Georgetown University

Herschel Sidransky, *Professor of Pathology*
B.S. 1948, M.D. 1953, M.S. 1958, Tulane University

Michael Elliot Siegel, *Assistant Clinical Professor of Radiology (Allied Health Sciences)*
B.A. 1964, Cornell University; M.D. 1968, University of Health Sciences, The Chicago Medical School

Robert Stanley Siegel, *Clinical Instructor in Surgery (Oral Surgery)*
B.S. 1958, D.D.S. 1961, University of Maryland

Rubin Louis Siegel, *Special Lecturer in Psychiatry and Behavioral Sciences*
B.S. 1930, City University of New York, City College; M.D. 1936, Royal Colleges, Scotland

Tomas Jose Silber, *Assistant Professor of Child Health and Development*
B.A. 1959, Colegio Acassuso; M.D. 1966, University of Buenos Aires

Howard Silby, *Assistant Clinical Professor of Neurology*
B.A. 1957, Dartmouth College; M.D. 1962, State University of New York at Buffalo

Carlos Alberto Silva, *Assistant Clinical Professor of Surgery*
B.S. 1956, University of Puerto Rico; M.D. 1960, George Washington University

Omega Cecile Logan Silva, *Assistant Professor of Medicine*
B.S. 1958, M.D. 1967, Howard University

Harold Martin Silver, *Clinical Professor of Medicine*
B.A. 1946, M.D. 1949, Columbia University

Mary Rottschaefer Silverman, *Assistant Professor of Health Care Sciences*
B.S.N. 1965, M.P.H. 1970, University of Michigan

David Bart Simon, *Assistant Clinical Professor of Medicine*
M.D. 1967, George Washington University

Ernest Robert Simon, *Professor of Medicine*
M.D. 1954, Harvard University

Kenneth Alan Simon, *Assistant Clinical Professor of Ophthalmology*
B.A. 1952, University of Pennsylvania; M.S. 1955, M.D. 1957, Yale University

Thomas Gordon Sinderson, *Assistant Clinical Professor of Medicine*
B.A. 1965, Emory University; M.D. 1969, George Washington University

Herbert Charles Singer, *Assistant Clinical Professor of Medicine*
B.A. 1960, Ohio Wesleyan University; M.D. 1964, Washington University

Baikunth Kumar Singh, *Assistant Clinical Professor of Medicine*
M.B., B.S. 1960, Nagpur University, India

Maurice Arthur Sislen, *Assistant Clinical Professor of Medicine*
B.A. 1944, M.D. 1947, George Washington University

James Glover Sites, *Professor of Obstetrics and Gynecology*
M.D. 1947, George Washington University

John Chauncey Skilling, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1955, Princeton University; M.D. 1961, Hahnemann Medical College

Shirley Weiss Skoler, *Clinical Instructor in Psychiatry and Behavioral Science*
B.A. 1951, New York University; M.S.W. 1969, Howard University

Barton Kent Slemmons, *Associate Professor of Orthopaedic Surgery*
B.A. 1952, University of North Dakota; M.D. 1954, University of Illinois

Alvin Jay Slovin, *Assistant Professor of Surgery*
B.A. 1959, Harvard University; M.D. 1963, State University of New York Downstate Medical Center

Allen Small, *Clinical Instructor in Otolaryngology*
B.A. 1962, Columbia University; M.D. 1966, State University of New York Downstate Medical Center

Benjamin Williams Smith, *Professor of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University

Bruce Hamilton Smith, *Professor of Pathology*
B.A. 1940, M.D. 1943, Syracuse University

Donald Ray Smith, *Associate Professor of Neurological Surgery*
M.D. 1963, Louisiana State University, New Orleans

James Cecil Smith, Jr., *Professorial Lecturer in Biochemistry*
B.S. 1956, M.S. 1959, Ph.D. 1964, University of Maryland

James Joseph Smith, *Clinical Professor of Radiology (Nuclear Medicine)*
B.A. 1932, Catholic University of America; M.D. 1940, Yale University

Joseph Smith, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1947, M.D. 1952, University of Virginia

Lee Elton Smith, *Assistant Professor of Surgery*
B.A. 1959, University of California, Berkeley; M.D. 1962, University of California, San Francisco

Robert Benjamin Warfield Smith, *Associate Clinical Professor of Medicine*
M.D. 1949, Columbia University

Ronald Walter Smith, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1953, University of Maryland; M.D. 1957, George Washington University

Marija Demsar Smokvina, *Clinical Instructor in Child Health and Development*
M.D. 1959, University of Ljubljana, Yugoslavia

Bruce Melvyn Smoller, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1965, Cornell University; M.D. 1969, Tulane University

Nicholas Patrick Dillon Smyth, *Associate Clinical Professor of Surgery*
M.S. 1948, M.B., Ch.B. 1949, University College, Ireland; M.S. 1954, University of Michigan

Richard Saxon Snell, *Professor of Anatomy and of Orthopaedic Surgery*
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, University of London

Paul Snow, *Assistant Clinical Professor of Pathology*
B.S. 1958, Centenary College of Louisiana; M.D. 1962, Louisiana State University, New Orleans

Joseph Snyder, *Clinical Instructor in Ophthalmology*
B.A. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

Jonas Sode, *Professor of Medicine*
M.D. 1951, University of Marburg

Edgar Henry Soifer, *Assistant Clinical Professor of Urology*
B.A. 1953, Washington and Jefferson College; M.D. 1957, New York University

Jose Tomas Solano, *Assistant Clinical Professor of Medicine*
B.S. 1951, Colegio San Bartolome; M.D. 1957, Javeriana University, Colombia

Kevin Raymond Sorem, *Instructor in Health Care Sciences*
B.A. 1970, Rhode Island College; B.S. 1973, State University of New York at Stony Brook

Eleanor Attianese Sorrentino, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Bryn Mawr College; M.D. 1962, Harvard University

Peter Soyster, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1948, George Washington University

Samuel Vincent Spagnolo, *Associate Professor of Medicine*
B.A. 1961, Washington and Jefferson College; M.D. 1965, Temple University

George Speck, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1937, University of Michigan; M.D. 1941, George Washington University

Israel Spector, *Clinical Instructor in Medicine*
B.S. 1958, City University of New York, Brooklyn College; M.D. 1962, University of Health Sciences, Chicago Medical School

Ian James Spence, *Assistant Clinical Professor of Urology*
B.S. 1955, Union College, New York; M.D. 1959, Albany Medical College of Union University

Paul Stephen Spiegler, *Clinical Instructor in Medicine*
B.A. 1960, New York University; M.D. 1969, George Washington University

Kenneth Robert Spring, *Assistant Professorial Lecturer in Physiology*
D.M.D. 1966, Tufts University; Ph.D. 1971, State University of New York at Buffalo

Jeanne Spurlock, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1947, Howard University

Jorge Carlos Srabstein, *Assistant Professor of Child Health and Development and of Obstetrics and Gynecology*
M.D. 1966, University of Buenos Aires

Charles Jay Stahl III, *Professor of Pathology*
B.S. 1952, Ursinus College; M.D. 1956, Thomas Jefferson University

Raymond Standard, *Associate Clinical Professor of Medicine*
B.S. 1948, M.D. 1952, Howard University; M.P.H. 1967, Johns Hopkins University

William Stark, *Clinical Professor of Child Health and Development and o*
Psychiatry and Behavioral Sciences
B.A. 1939, New York University; M.D. 1943, University of Louisville

Roger James Starkweather, *Assistant Professor of Orthopaedic Surgery*
B.A. 1967, Northwestern University; M.D. 1971, George Washington University

Henry Joseph Starr, *Clinical Instructor in Ophthalmology*
B.A. 1955, Bowdoin College; M.D. 1959, Johns Hopkins University

Antonio Stazio, *Associate Clinical Professor of Neurology*
M.D. 1954, University of Naples, Italy

Edwin Arthur Steane, *Assistant Professorial Lecturer in Physiology*
B.S. 1966, University of Wisconsin—Milwaukee; Ph.D. 1974, George Washington University

Ruth Lebo Steerman, *Assistant Clinical Professor of Child Health and Develop*
ment
M.D. 1967, George Washington University

Edward Steers, Jr., *Professorial Lecturer in Biochemistry*
B.S. 1959, Ph.D. 1963, University of Pennsylvania

Arthur Harold Stein, *Assistant Clinical Professor of Psychiatry and Behavioral*
Sciences and of Child Health and Development
B.A. 1962, Harvard University; M.D. 1966, Cornell University

Harry Calvin Stein, *Clinical Instructor in Otolaryngology*
B.S. 1961, Loyola College; M.D. 1965, University of Maryland

Walter Anthony Stein, *Instructor in Health Care Sciences*
B.S. 1973, State University of New York at Stony Brook

Harvey Steinberg, *Assistant Clinical Professor of Psychiatry and Behavioral*
Sciences
B.A. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

Peter Joseph Steinglass, *Assistant Professor of Psychiatry and Behavioral*
Sciences and of Health Care Sciences
B.A. 1960, Union College, New York; M.D. 1965, Harvard University

James Stengle, *Associate Professor of Medicine*
B.A. 1942, Oberlin College; M.D. 1946, Northwestern University

Melvin Joseph Stern, *Associate Clinical Professor of Medicine and of Psychiatry*
and Behavioral Sciences
B.A. 1961, M.D. 1965, Yeshiva University

Harold Stevens, *Professor of Neurology*
B.S. 1933, Pennsylvania State University; M.A. 1934, Ph.D. 1937, M.D. 1941, University of
Pennsylvania

Steele Fuller Stewart, Jr., *Associate Clinical Professor of Obstetrics and Gyne-*
cology
B.A. 1950, Carleton College; M.D. 1959, University of Pennsylvania

Merril Stock, *Assistant Professor of Medicine*
B.S. 1967, Albright College; M.D. 1971, Thomas Jefferson University

William James Stockton, *Associate Clinical Professor of Psychiatry and Behav-*
ioral Sciences
M.D. 1956, University of Oklahoma

Myer Harold Stolar, *Clinical Professor of Medicine*
B.S. 1936, George Washington University; M.D. 1941, Georgetown University

Samuel Stoleru, *Clinical Instructor in Ophthalmology*
B.S. 1961, Colegio Hebreo Jorge Isaacs, Colombia; M.D. 1968, Universidad del Valle, Colom-

Alan William Stone, *Assistant Professor of Health Care Sciences and of Medicine*
B.A. 1961, Harvard University; M.D. 1966, Yale University

Bernard Stopak, *Clinical Instructor in Neurological Surgery*
B.S. 1959, University of Maryland; M.D. 1970, Universite de Montpellier, France

Belinda Crompton Straight, *Associate Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
M.D. 1952, New York University

Barry Leslie Strauss, *Assistant Professor of Medicine*
B.A. 1967, Cornell University; M.D. 1971, George Washington University

James Ashley Straw, *Professor of Pharmacology*
B.S. 1958, Ph.D. 1963, University of Florida

Carroll Edward Streetman, Jr., *Instructor in Health Care Sciences*

Edward Michael Strehlau, *Special Lecturer in Health Care Sciences*

Franklin Lyle Stroud, *Clinical Instructor in Child Health and Development*
B.S. 1961, M.D. 1965, University of Illinois

Vern Oscar Strubeck, Jr., *Special Lecturer in Pathology*
B.A. 1973, University of Montana

Richard Earl Struempler, *Clinical Instructor in Pathology*
B.S. 1970, University of Houston; M.S. 1972, Louisiana Technical University

Donald Lee Sturtz, *Assistant Professor of Surgery*
B.S. 1955, U.S. Naval Academy; M.D. 1965, University of Pennsylvania

Samuel Jacob Nathan Sugar, *Associate Clinical Professor of Health Care Sciences*
Phar.G. 1931, M.D. 1938, George Washington University

Dennis Damon Sullivan, *Special Lecturer in Pathology*

Thomas Sullivan, *Assistant Clinical Professor of Child Health and Development*
B.A. 1960, M.D. 1964, Seton Hall University

Roberto Navarro Sunga, *Assistant Professor of Ophthalmology*
M.D. 1958, University of the Philippines

Amin Mohammed Suria, *Assistant Professor of Pharmacology*
B.S. 1963, M.S. 1964, University of Karachi, Pakistan; Ph.D. 1971, Vanderbilt University

John Peter Swope, *Assistant Clinical Professor of Anesthesiology*
B.S. 1958, U.S. Naval Academy; M.D. 1966, Georgetown University; M.S. 1970, Case Western Reserve University

Stephen Istvan Szara, *Associate Clinical Professor of Psychiatry and Behavioral Sciences (Psychopharmacology)*
Arbitur 1941, D.Sc. 1950, M.D. 1951, University of Budapest

Ellis Mason Taft, *Special Lecturer in Health Care Sciences*

Stanley Jerome Talpers, *Associate Clinical Professor of Medicine*
B.A. 1948, M.D. 1953, University of Colorado

John Alexis Lam Sang Tam, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1967, University of Hong Kong

Irene Gorski Tamagna, *Professor of Medicine*
M.D. 1943, Medical College of Pennsylvania

Annop Tantisunthorn, *Clinical Instructor in Child Health and Development*
M.D. 1966, Tokyo Medical and Dental University

Nelson Monroe Tart, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1949, Wake Forest University; M.D. 1955, George Washington University

Norman Taub, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1937, M.D. 1941, University of Chicago

Joel Taubin, *Assistant Clinical Professor of Medicine*
B.A. 1963, M.A. 1965, George Washington University; M.D. 1969, University of Virginia

Edith Taylor, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.S. 1945, Radcliffe College; M.D. 1949, Harvard University

Raquel Teitel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, Instituto Nacional del Profesorado; M.A. 1965, City University of New York, City College; Ph.D. 1973, American University

Sarah Shtoffer Tenenblatt, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1942, M.D. 1944, University of California, Berkeley

Bernard Scott Teunis, *Assistant Clinical Professor of Surgery*
B.A. 1958, M.D. 1962, University of Virginia

Maung Htoon Thein, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1967, Institute of Medicine I, Burma

Robert Raymond Therrien, *Special Lecturer in Pathology*
B.S. 1970, Bates College

Stanley William Theune, *Assistant Clinical Professor of Pathology*
B.S. 1966, Wisconsin State University

Richard Barry Theus, *Assistant Research Professor of Radiology*
B.S. 1948, Stetson University

James Richard Thistlethwaite, *Clinical Professor of Surgery*
B.S. 1943, University of Richmond; M.D. 1947, Duke University

Frances Bagwell Thomas, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1961, M.S.W. 1963, University of North Carolina

Lawrence Jay Thomas, *Associate Clinical Professor of Medicine*
B.S. 1934, New York University; M.D. 1938, George Washington University

Martin Alfred Thomas, *Assistant Clinical Professor of Radiology*
B.S. 1948, Purdue University; M.D. 1952, Indiana University at Indianapolis

Anne Marie Salmon Thompson, *Assistant Professor of Medicine*
B.A. 1963, Immaculata College; M.D. 1967, Thomas Jefferson University

Charles Waters Thompson, *Clinical Professor of Medicine*
M.D. 1941, George Washington University

Earle Brosius Thompson, *Assistant Clinical Professor of Medicine*
B.S. 1945, Franklin and Marshall College; M.D. 1945, University of Pennsylvania

Lewis William Thompson, *Associate Professor of Surgery and of Child Health and Development*
B.A. 1955, Asbury College; M.D. 1960, Wake Forest University

William Frederic Thompson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1963, City University of New York, City College; M.D. 1967, George Washington University

Unnur Thorgeirsson, *Adjunct Instructor in Pathology*
M.D. 1969, University of Iceland

Jeffrey Scott Thorkelsen, *Special Lecturer in Radiology*

George John Thorpe, *Assistant Clinical Professor of Medicine*
B.A. 1956, M.D. 1960, Case Western Reserve University

Gertrude Ruth Ticho, *Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1944, University of Vienna

Charles Stanley Tidball, *Henry D. Fry Professor of Physiology and Research Professor of Medicine*
B.A. 1950, Wesleyan University; M.S. 1952, University of Rochester; Ph.D. 1955, University of Wisconsin; M.D. 1958, University of Chicago

Mary Elizabeth Tidball, *Professor of Physiology*
B.A. 1951, L.H.D. 1976, Mount Holyoke College; M.S. 1955, Ph.D. 1959, University of Wisconsin; Sc.D. 1973, Wilson College; D.Sc. 1974, Trinity College, District of Columbia; D.Hum. 1977, Saint Mary's College, Indiana; D.Sc. 1977, Cedar Crest College

George Tievsky, *Clinical Instructor in Radiology*
B.S. in Phar. 1939, M.D. 1943, George Washington University

Bruce Purdy Tinker, *Clinical Instructor in Medicine*
B.S. 1966, Michigan State University; M.D. 1971, Wayne State University

Donn Lloyd Tippett, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1947, Ohio State University

Evadne Marjorie Titer, *Clinical Instructor in Ophthalmology*
B.S. 1963, M.D. 1967, Howard University

Elijah White Titus, Jr., *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1952, George Washington University

Raymond Eugene Tobey, *Associate Professor of Anesthesiology*
B.A. 1954, Brown University; M.D. 1958, Tufts University

Jane Wendy Lehu Todaro, *Associate Professor of Child Health and Development*
B.A. 1960, Vassar College; M.D. 1965, New York University

Charles Eby Townsend, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1948, M.D. 1951, George Washington University

Carleton Raymond Treadwell, *Professor of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

Howard Pettit Treichler, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1946, George Washington University

Herman Thomas Trettel, *Clinical Instructor in Pathology (Laboratory Medicine)*
B.S. 1971, St. Cloud State College

William MacLohon Trible, *Clinical Professor of Otolaryngology*
B.A. 1943, Princeton University; M.D. 1950, George Washington University; M.S. in Med. 1956, University of Pennsylvania

Charles Lawrence Trichilo, *Assistant Professorial Lecturer in Biochemistry*
B.A. 1968, M.Phil., Ph.D. 1971, George Washington University

Paul Emerson Trievel, *Special Lecturer in Health Care Sciences*

Gordon Anderson Tripp, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1957, Harvard University; M.D. 1961, Duke University

Nelson Perez Trujillo, *Associate Clinical Professor of Medicine*
B.S. 1955, Baldor Academy, Cuba; M.D. 1962, Tulane University

Bernard Tsai, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.D. 1970, Taipei Medical College

Neofytos Theodore Tsangaris, *Associate Professor of Surgery*
B.S. 1952, Duke University; M.D. 1956, George Washington University

Mark On-Man Ts'o, *Associate Research Professor of Ophthalmology*
M.B., B.Surg. 1961, University of Hong Kong

Carmelita Uichanco Tuazon, *Assistant Professor of Medicine*
B.S. 1963, M.D. 1967, University of the Philippines

Lena Feinstein Turner, *Clinical Instructor in Pathology*

Lester Turner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, M.A. 1960, Ph.D. 1967, University of Texas

Maria Lourdes Turner, *Assistant Clinical Professor of Dermatology and of Medicine*
B.S. 1958, M.D. 1961, University of the Philippines

Raymond William Turner, *Assistant Clinical Professor of Medicine*
B.A. 1954, Amherst College; M.D. 1958, Yale University

Arthur Richard Ugel, *Assistant Clinical Professor of Dermatology and of Child Health and Development*
B.S. 1961, M.D. 1965, George Washington University

Herbert Andrew Urweider, *Assistant Clinical Professor of Ophthalmology*
B.A. 1954, Bowdoin College; M.D., C.M. 1958, McGill University

George Vartkes Vahouny, *Professor of Biochemistry*
B.S. 1953, M.S. 1955, Ph.D. 1958, George Washington University

John Miller Van Buren, *Clinical Professor of Neurological Surgery*
B.A. 1943, Dartmouth College; M.D. 1947, Columbia University; M.S. 1950, McGill University; Ph.D. 1961, George Washington University

Mary Ann Vander Maten, *Assistant Research Professor of Biochemistry*
B.A. 1971, Northwestern College, Iowa; Ph.D. 1975, University of Kansas

Robert James Van Houten, *Professor of Anesthesiology; Assistant Dean for Graduate and Continuing Medical Education*
B.S. 1950, Albright College; M.D. 1954, Hahnemann Medical College

Anna Maria Louize Van Rooy, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1953, University of Utrecht, The Netherlands

Vijay Mohan Varma, *Professor of Radiology*
M.B., B.S. 1958, Osmania University; M.D. 1963, All India Institute of Medical Sciences

Paul Guerin Ventry, *Assistant Clinical Professor of Medicine*
B.S. 1957, Manhattan College; M.D. 1962, State University of New York Upstate Medical Center

Leonard Louis Vertuno, *Assistant Professor of Medicine*
B.S. 1961, M.D. 1964, Northwestern University

Brantley Paul Vitek, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1957, Western Maryland College; M.D. 1961, University of Maryland

James Wells Voell, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1959, Marquette University

Hilda Tawil Vollero, *Clinical Instructor in Neurology and in Child Health and Development*
B.S. 1961, M.D. 1966, American University of Beirut, Lebanon

Carl Marvin Voyles, *Associate Professor of Medicine*
B.S. 1945, College of William and Mary; M.D. 1945, Duke University

Ralph Weyman Wadeson, Jr., *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1947, University of Alabama in Birmingham

Robert Stephen Waldman, *Clinical Instructor in Medicine*
B.A. 1957, University of Pennsylvania; M.D. 1961, Georgetown University

Francis Neil Waldrop, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1946, University of Minnesota; M.D. 1950, George Washington University

Jeremy Peter Waletzky, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Yale University; M.D. 1968, Columbia University

Jerome Aloysius Waliszewski, *Special Lecturer in Radiology (Nuclear Medicine)*

Glenn Anthony Walker, *Associate Professor of Biochemistry*
B.A. 1958, Bellarmine College; Ph.D. 1963, Michigan State University

Haven Neill Wall, *Assistant Clinical Professor of Medicine*
B.S. 1965, Marshall University; M.D. 1969, University of Maryland

William Davies Wallace, Jr., *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1949, Westminster College, Pennsylvania; M.D. 1953, Thomas Jefferson University

Francis Michael Walsh, *Assistant Clinical Professor of Pathology*
B.S. 1967, University of Notre Dame; M.D. 1971, Medical College of Wisconsin

James Christopher Walsh, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1941, M.D. 1945, Georgetown University

John Walter Walsh, *Associate Clinical Professor of Medicine*
B.S. 1938, St. Francis College, New York; M.D. 1942, State University of New York Downstate Medical Center

Max Graff Walten, Jr., *Clinical Instructor in Child Health and Development*
B.A. 1960, Columbia University; M.D. 1965, University of Virginia

Donald Walters, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1939, M.D. 1943, University of Virginia

Ching-Te Wang, *Assistant Clinical Professor of Pathology*
Ph.D. 1971, University of Illinois

David Murray Wanicur, *Clinical Instructor in Ophthalmology*
B.A. 1961, University of Pennsylvania; M.D. 1965, University of Pittsburgh

Archibald Ward, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences (Sociology)*
B.S. 1933, North Carolina State University at Raleigh; B.D. 1937, Crozer Theological Seminary; Ph.D. 1947, University of Maryland

George William Ward, Jr., *Assistant Clinical Professor of Medicine*
B.S. 1956, U.S. Military Academy; M.D. 1963, George Washington University

Robert Edward Ware, *Assistant Clinical Professor of Urology*
M.D. 1953, Medical College of Virginia of Virginia Commonwealth University

William Joseph Washington, Jr., *Associate Clinical Professor of Health Care Sciences*
B.A. 1944, Talladega College; M.D. 1947, Howard University

Elzberry Waters, Jr., *Assistant Research Professor of Medical and Public Affairs*
B.A. 1963, M.A. 1965, George Washington University; Ph.D. 1973, American University

Don Wayne Watkins, *Associate Professor of Physiology*
B.Ch.E. 1963, University of Louisville; Ph.D. 1968, University of Wisconsin

George Allyn Watling, *Special Lecturer in Health Care Sciences*

Benny Waxman, *Professor of Obstetrics and Gynecology*
M.D. 1957, University of Western Ontario

Bruce Waxman, *Visiting Professor of Clinical Engineering*
B.A. 1953, University of Pennsylvania; M.A. 1955, University of Connecticut; Ph.D. 1974, University of Chicago

Kenneth Earl Weaver, *Assistant Professor of Radiology (Radiation Physics)*
B.S. 1966, California State University, Los Angeles; M.S. 1968, Oregon State University

Blair McWhorter Webb, *Associate Clinical Professor of Otolaryngology and of Child Health and Development*
B.S. 1951, Hampden-Sydney College; M.D. 1955, University of Virginia

Russell Ellenwood Webber, Jr., *Special Lecturer in Health Care Sciences*

William Farnsworth Weber, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1962, Yale University

Thomas Glenn Webster, *Professor of Psychiatry and Behavioral Sciences*
B.A. 1946, Fort Hays Kansas State College; M.D. 1949, Wayne State University

Bryant Wedge, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1945, University of Michigan

William Joseph Weiler, *Special Lecturer in Radiology*

Harold Weiner, *Clinical Professor of Psychiatry and Behavioral Sciences (Experimental Psychology)*
B.B.A. 1953, City University of New York, City College; M.A. 1957, Ph.D. 1960, University of Maryland

Paul Lee Weiner, *Assistant Clinical Professor of Radiology*
B.A. 1967, Lafayette College; M.D. 1971, Georgetown University

Allan Byrne Weingold, *Professor of Obstetrics and Gynecology*
B.A. 1951, Oberlin College; M.D. 1955, New York Medical College

Jacob Joseph Weinstein, *Assistant Clinical Professor of Surgery*
Phar.G. 1930, B.S. 1934, M.D. 1936, University of Maryland

Herbert Weintraub, *Professor of Anesthesiology*
B.A. 1950, New York University; M.A. 1958, B.M., B.Ch. 1959, Oxford University

Paul Stephen Weisberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, Harvard University; M.D. 1958, Marquette University

Ira Paul Weiss, *Assistant Professorial Lecturer in Child Health and Development and in Physiology*
B.S. 1965, City University of New York, City College; Ph.D. 1969, Syracuse University

Lowell Martin Weiss, *Associate Clinical Professor of Medicine*
B.S. 1957, Rutgers—The State University; M.D. 1962, George Washington University

Stephen Weissman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Cornell University; M.D. 1963, Yeshiva University

Isaac Weiszer, *Assistant Clinical Professor of Medicine*
B.S. 1956, M.D. 1960, University of Illinois

James Lansing Wellhouse, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1948, University of Iowa; M.D. 1952, Washington University

Louis Wener, *Clinical Instructor in Radiology*
M.D. 1956, University of Tennessee

Mario Werner, *Professor of Pathology (Laboratory Medicine)*
M.D. 1960, University of Zurich

Stanley Gerald Werner, *Assistant Clinical Professor of Child Health and Development*
B.S. 1948, Stanford University; B.A. 1950, M.D. 1952, University of Illinois

Stephan Lionel Werner, *Clinical Instructor in Urology*
B.A. 1960, Clark University; M.D. 1960, Yeshiva University

Gloria Ruth Goldsmith Werth, *Assistant Clinical Professor of Medicine*
B.A. 1949, Goucher College; M.D. 1953, Johns Hopkins University

Helen Reichmann West, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1969, Ph.D. 1973, George Washington University

Ezell Westbrook, *Clinical Instructor in Radiology*

Jean Kendrick Weston, *Adjunct Professor of Clinical Engineering*
B.A. 1930, M.S. 1931, University of Michigan; Ph.D. 1933, M.D. 1941, Temple University

Kathleen Shingler Weston, *Associate Professorial Lecturer in Anatomy*
B.A. 1929, Northern Michigan University; M.A. 1934, University of Michigan; M.D. 1951, Temple University

Carol June Weyland, *Clinical Instructor in Psychiatry and Behavioral Sciences and in Child Health and Development*
B.A. 1967, University of California, Berkeley; Ph.D. 1976, Catholic University of America

Charles Stanley White III, *Assistant Professor of Medicine*
B.A. 1965, Harvard University; M.D. 1969, University of Pittsburgh

Henry Sindos Wicker, *Assistant Clinical Professor of Ophthalmology*
B.S. 1948, Xavier University of Louisiana; M.D. 1953, Howard University

Jerry Wiener, *Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1956, Baylor University

Robert Shaw Wilkinson, *Associate Clinical Professor of Medicine*
B.A. 1950, Dartmouth College; M.D. 1955, New York University

Ann Lottie Barnett Williams, *Clinical Instructor in Medicine*
M.B., B.S. 1965, University of London; D.M.R.C.S., L.R.C.P. 1965, Royal College of Physicians and Surgeons; D.Obst.R.C.O.G. 1966, Royal College of Obstetricians and Gynecologists

Jonathan Marshall Williams, *Clinical Professor of Neurological Surgery*
B.S. in Med. 1936, Loyola University of Chicago; M.D. 1938, University of Chicago

Marjorie Joan Williams, *Assistant Clinical Professor of Pathology*
M.D. 1943, University of Bristol

Elliot Charles Wilner, *Assistant Clinical Professor of Neurology*
B.A. 1958, Columbia University; M.D. 1962, George Washington University

Norman Edward Wilson, *Assistant Clinical Professor of Anesthesiology*
B.A. 1967, Brandeis University; M.D. 1971, Thomas Jefferson University

Norman Louis Wilson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1959, Yale University; M.D. 1963, Harvard University

Thomas Ashton Wilson, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1942, M.D. 1944, George Washington University

Alan William Winshel, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1948, Temple University; M.D. 1952, Hahnemann Medical College

Herbert Saul Winston, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1953, Harvard University; M.D. 1957, Yale University

Karl Wipplinger, *Associate Professor of Medicine*
M.D. 1953, University of Vienna

James Howard Wise, *Assistant Professor of Child Health and Development*
B.A. 1963, Adelphi University; M.A. 1965, Ph.D. 1969, George Washington University

Jarrett Michael Wise, *Assistant Professor of Health Care Sciences*
B.S. in A.H.S. 1971, Duke University

Leonard Arthur Wisneski, *Clinical Instructor in Medicine*
B.S. 1969, Drexel University; M.D. 1973, Thomas Jefferson University

Meade Graham Withrow, Jr., *Special Lecturer in Radiology*

Philip Witorsch, *Associate Professor of Medicine*
B.A. 1958, M.D. 1962, New York University

Jeffrey Francis Witte, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1963, Georgetown University; M.D. 1967, University of Michigan

Paul Frederick Wohlford, *Associate Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1959, Harvard University; Ph.D. 1964, Duke University

Elma Kahn Wolf, *Adjunct Instructor in Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1928, University of California, Berkeley

Muriel Ruth DuBrow Wolf, *Associate Professor of Child Health and Development*
B.A. 1957, Smith College; M.D. 1959, Yale University

Stanley Irving Wolf, *Associate Clinical Professor of Child Health and Development*
B.S. 1947, M.D. 1948, Georgetown University

Martin Samuel Wolfe, *Associate Clinical Professor of Medicine*
B.A. 1957, M.D. 1961, Cornell University; D.C.M.T. 1967, London School of Hygiene and Tropical Medicine

Frederick William Wolff, *Professor of Medicine*
M.B., B.S. 1946, M.D. 1957, University of Durham

Steven Joel Wolin, *Associate Clinical Professor of Medicine and of Psychiatry and Behavioral Sciences*
B.A. 1962, Brown University; M.D. 1966, Yeshiva University

Michael Aime Woodbury, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
Ph.B. 1942, University of Paris; B.A. 1945, M.D. 1951, Harvard University

Sylvia Bernice Wood Wooten, *Assistant Clinical Professor of Child Health and Development*
B.S. 1963, Morgan State College; M.D. 1967, Howard University

Henry Harcus Work, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1933, Hamilton College; M.D. 1937, Harvard University

James Newton Wray, *Special Lecturer in Health Care Sciences*

Alvin Charles Wyman, *Clinical Professor of Radiology*
B.A. 1939, Cornell University; M.D. 1943, New York University

Ronald Wynn, *Special Lecturer in Health Care Sciences*

Jean Haroutian Yacoubian, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1947, M.D. 1951, American University of Beirut

William Shigeru Yamamoto, *Professor of Clinical Engineering*
B.A. 1945, Park College; M.D. 1949, M.A. 1971, University of Pennsylvania

Harold Taylor Yates, *Associate Clinical Professor of Child Health and Development*
M.D. 1941, University of Virginia

Leon Yochelson, *Professor of Psychiatry and Behavioral Sciences*
B.A. 1938, M.D. 1942, State University of New York at Buffalo

Dal Yoo, *Assistant Clinical Professor of Medicine*
M.D. 1967, Seoul National University

Delosa Anthony Young, *Clinical Instructor in Child Health and Development*
B.A. 1959, Loyola University, New Orleans; M.D. 1962, Louisiana State University

Ira Sanders Young, *Assistant Clinical Professor of Urology*
B.A. 1955, Lafayette College; M.D. 1959, George Washington University

William Hurlburt Young, Jr., *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1942, Harvard University; M.D. 1945, University of Michigan

Hanna Samir Zakharia, *Assistant Professor of Ophthalmology*
B.S. 1964, M.D. 1968, American University of Beirut

Paul Zamick, *Assistant Professor of Surgery (Plastic Surgery)*
B.A. 1952, University of Manitoba; L.R.C.S.I., M.D. 1958, Royal College of Surgeons, Ireland

Anthony Zappala, *Assistant Professorial Lecturer in Psychiatry and Behavioral Sciences*
M.D. 1942, George Washington University

Bernard Harold Zeavin, *Assistant Clinical Professor of Ophthalmology*
M.D. 1950, University of Manitoba

Jack Arnold Zeller, *Assistant Professor of Pathology (Laboratory Medicine)*
B.A. 1960, Columbia University; M.D. 1964, New York Medical College

Alan Barry Zients, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1959, Dartmouth College; M.D. 1963, New York University

Carl Jesse Zimmerman, Jr., *Special Lecturer in Radiology*

Ernest Michael Zimmerman, *Clinical Instructor in Ophthalmology*
M.D. 1963, University of Toronto

Hyman Joseph Zimmerman, *Professor of Medicine*
B.A. 1936, University of Rochester; M.A. 1938, M.D. 1942, Stanford University

Isaiah Morris Zimmerman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, M.S.W. 1967, University of California, Berkeley; Ph.D. 1967, Catholic University of America

Jack Evans Zimmerman, *Associate Professor of Anesthesiology and of Medicine*
B.S. 1960, University of Maryland; M.D. 1964, George Washington University

Lorenz Eugene Zimmerman, *Clinical Professor of Ophthalmology and of Ophthalmic Pathology*
B.A. 1943, M.D. 1945, George Washington University

Mervin Harvey Zimmerman, *Assistant Clinical Professor of Ophthalmology*
M.D. 1959, University of Toronto

John Zinner, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Amherst College; M.D. 1963, Harvard University

Bernard Charles Zook, *Associate Professor of Pathology (Comparative)*
B.S. 1962, D.V.M. 1963, Colorado State University

Assistants in Research and Instruction 1976–77

Brent Roger Ain, *Assistant in Orthopaedic Surgery*
B.A. 1967, University of Rochester; M.D. 1972, Tulane University

Katherine Louise Alley, *Assistant in Surgery*
B.A. 1970, University of Arkansas; M.D. 1974, George Washington University

Rodger William Althoff, *Assistant in Surgery*
B.A. 1968, Kent State University; M.D. 1972, George Washington University

Richard Slee Altman, *Assistant in Medicine*
B.A. 1970, Franklin and Marshall College; M.D. 1974, George Washington University

Bruce Leslie Ames, *Assistant in Obstetrics and Gynecology*
B.A. 1971, Lehigh University; M.D. 1975, The University of Health Sciences/Chicago Medical School

Roger Amick, *Assistant in Anesthesiology*
B.A. 1970, Marshall University; M.D. 1974, George Washington University

Bruce Jorge Ammerman, *Assistant in Neurological Surgery*
B.A. 1968, Case Western Reserve University; M.D. 1972, George Washington University

Marta Archutowska-Kempka, *Assistant in Neurology*
M.D. 1971, Higher School of Medicine, Poland

Pratibha Arora, *Assistant in Physical Medicine and Rehabilitation*
F.S.C. 1958, S.M. College, India; M.B., B.S. 1964, S.N. Medical College, India

Yoon Bong Auck, *Assistant in Anesthesiology*
M.D. 1973, Chunnan National University, Korea

Farid Azzam, *Assistant in Anesthesiology*
M.D. 1974, French Faculty of Medicine, Lebanon

Ellen Balsley, *Assistant in Psychiatry*
B.A. 1967, M.S. 1970, Indiana University; M.D. 1974, George Washington University

Susan Hazel Bane, *Assistant in Medicine*
B.A. 1968, M.D. 1974, George Washington University

Michael Edgar Beall, *Assistant in Urology*
B.A. 1968, Ohio Wesleyan University; M.D. 1972, George Washington University

Zia-Allah Behin Aien, *Assistant in Anesthesiology*
M.D. 1972, Pahlavi University, Iran

Robert Urban Bennett, *Assistant in Orthopaedic Surgery*
B.A. 1969, Drury College; M.D. 1973, University of Missouri—Columbia

Robert Allen Berenson, *Assistant in Health Care Sciences*
B.A. 1968, Brandeis University; M.M.S. 1970, College of Medicine and Dentistry of New Jersey, Rutgers Medical School; M.D. 1972, Mt. Sinai School of Medicine

Alan Benjamin Bergman, *Assistant in Radiology*
B.A. 1969, New York University; M.D. 1973, Rush Medical College

Michael Enrico Bernardino, *Assistant in Radiology*
B.A. 1969, Case Western Reserve University; M.D. 1973, Ohio State University

George Andrew Besch, *Assistant in Medicine*
B.S. 1971, Trinity College, Connecticut; M.D. 1975, George Washington University

Helga Binder, *Assistant in Physical Medicine and Rehabilitation*
M.D. 1957, Berlin Humboldt University, Germany

Renee Sharon Binder, *Assistant in Radiology*
B.A. 1970, University of Wisconsin; M.D. 1974, University of Illinois

Frederick Charles Blades, *Assistant in Ophthalmology*
B.A. 1965, University of Maine; M.D. 1969, George Washington University

Richard Harvey Blum, *Assistant in Medicine*
B.S. 1970, Yale University; M.D. 1974, Temple University

George Robert Bowers, *Assistant in Medicine*
B.A. 1969, Gettysburg College; M.D. 1972, Medical College of Virginia of Virginia Commonwealth University

George Bren, *Assistant in Medicine*
B.S. 1973, M.D. 1975, Northwestern University

Frank Logan Brown, Jr., *Assistant in Medicine*
B.S. 1970, Howard University; M.D. 1974, Yale University

Peter Alexander Bryce, *Assistant in Obstetrics and Gynecology*
B.A. 1967, Inter-American University, Puerto Rico; M.D. 1974, Howard University

Paul Stephen Burka, *Assistant in Obstetrics and Gynecology*
B.A. 1969, University of Virginia; M.D. 1974, Georgetown University

Robert Brentwood Bux, *Assistant in Urology*
B.A. 1965, University of Texas at Austin; M.D. 1969, Tulane University

Thomas Ralph Callihan, *Assistant in Pathology*
B.A. 1969, Kenyon College; M.D. 1973, George Washington University

Rafael Cano, *Assistant in Pathology*
M.D. 1967, University of Madrid

Kathleen Frances Cheyney, *Assistant in Surgery*
B.A. 1970, Ohio Wesleyan University; M.D. 1974, Jefferson Medical College

John Henry Chidester, *Assistant in Orthopaedic Surgery*
B.A. 1966, Princeton University; M.D. 1970, University of Pennsylvania

Thomas Harding Clark, *Assistant in Medicine*
B.S. 1970, M.D. 1974, George Washington University

Alan Abood Cohen, *Assistant in Radiology*
B.A. 1971, M.D. 1975, George Washington University

Max Isaac Corndorf, *Assistant in Ophthalmology*
B.A. 1971, Emory University; M.D. 1975, University of Miami

John Alpert Cowin, *Assistant in Orthopaedic Surgery*
B.A. 1968, Gettysburg College; M.D. 1972, George Washington University

Marguerite Cowtun, *Assistant in Health Care Sciences*
B.S. 1965, University of Manitoba, Canada; M.D. 1973, Tufts University

Llewelyn Crooks, *Assistant in Obstetrics and Gynecology*
B.S. 1969, M.D. 1973, Howard University

William Penn Croom, Jr., *Assistant in Medicine*
B.A. 1969, Duke University; M.D. 1973, University of Virginia

David Ralph Curfman, *Assistant in Neurological Surgery*
B.A. 1965, Columbia Union College; M.S. 1967, M.D. 1973, George Washington Universe

Eugene Curletti, *Assistant in Surgery*
B.S. 1969, Tufts University; M.D. 1975, University of Vermont

Joseph Gordon Daines, Jr., *Assistant in Orthopaedic Surgery*
B.S. 1968, University of Utah; M.D. 1972, Columbia University

Paul Hartman D'Amato, *Assistant in Medicine*
B.A. 1965, Rutgers—The State University (New Brunswick); M.D. 1969, George Washingt
University

Sebastion James Dispenza, *Assistant in Obstetrics and Gynecology*
B.S. 1967, Belmont Abbey College; M.D. 1974, University of Virginia

Alexander Bertram Douglass, *Assistant in Urology*
B.A. 1969, Lafayette University; M.D. 1973, Hahnemann Medical College

Dale Clay Drennan, *Assistant in Physical Medicine and Rehabilitation*
B.A. 1968, University of Pennsylvania; M.D. 1972, Duke University

Amy Dwork-Berger, *Assistant in Obstetrics and Gynecology*
B.S. 1971, Dixon College; M.D. 1975, State University of New York Upstate Medical Cent

Barry Jay Efros, *Assistant in Medicine*
B.A. 1970, George Washington University; M.D. 1974, College of Medicine and Dentistry o
New Jersey, New Jersey Medical School

Leonard David Ehrlich, *Assistant in Medicine (Gastroenterology)*
B.A. 1968, City University of New York, Hunter College; M.D. 1972, George Washingto
University

Allan Melvin Eisenbaum, *Assistant in Ophthalmology*
B.A. 1968, M.D. 1972, George Washington University

Nicholas Ellyn, *Assistant in Ophthalmology*
B.A. 1971, University of Maryland; M.M.S. 1973, College of Medicine and Dentistry of Ne
Jersey, Rutgers Medical School; M.D. 1975, George Washington University

Edward Engle, *Assistant in Neurological Surgery*
B.A. 1969, Catholic University of America; M.S. 1971, Florida State University; M.D. 197
Jefferson Medical College

Neils Cary Engleberg, *Assistant in Medicine*
B.S. 1970, M.D. 1974, George Washington University

Abayomi Fakunle, *Assistant in Physical Medicine and Rehabilitation*
M.B., B.S. 1972, University of Lagos, Nigeria

Mary Huey Wei Fang, *Assistant in Medicine*
B.S. 1971, University of Maryland; M.D. 1974, Medical College of Virginia of Virginia Co
monwealth University

Nasrollah Fatehi, *Assistant in Neurological Surgery*
M.D. 1968, University of Tehran

Louis Thomas Feldgoise, *Assistant in Ophthalmology*
B.A. 1964, Case Western Reserve University; M.D. 1968, University of Pittsburgh

Nicholae Filipescu, *Assistant in Obstetrics and Gynecology*
M.S. 1957, Polytechnic Institute, Hungary; Ph.D. 1964, M.D. 1975, George Washingt
University

Jack Fisher, *Assistant in Surgery*
B.S. 1969, University of Illinois at Chicago; M.D. 1973, Emory University

Jean Long Fourcroy, *Assistant in Urology*
B.A. 1964, California State University, San Jose; M.D. 1974, Medical College of Pennsylvania

Cleveland Francis, Jr., *Assistant in Medicine (Cardiology)*
B.S. 1967, Southern University; M.A. 1969, College of William and Mary; M.D. 1973, Medical College of Virginia of Virginia Commonwealth University

Dennis Charles Friedman, *Assistant in Medicine*
B.S. 1971, Trinity College, Connecticut; M.D. 1975, University of Pennsylvania

Brian Joseph Gaffney, *Assistant in Medicine (Cardiology)*
B.S. 1968, Georgetown University; M.D. 1972, State University of New York Upstate Medical Center

Margaret Gainey, *Assistant in Radiology*
B.A. 1971, University of California, Berkeley; M.D. 1975, Georgetown University

Jorge Garciala, *Assistant in Radiology*
B.S. 1970, M.D. 1975, University of Michigan

Melinda Miller Gardner, *Assistant in Orthopaedic Surgery*
B.A. 1965, Duke University; M.D. 1974, George Washington University

Ronald Garson, *Assistant in Psychiatry and Behavioral Sciences*
B.A. 1971, Columbia University; M.D. 1974, University of Pennsylvania

Robert Allan Gatlin, *Assistant in Obstetrics and Gynecology*
B.A. 1969, Stanford University; M.D. 1973, George Washington University

Gerard Lawrence Gaughan, *Assistant in Medicine (Cardiology)*
B.S. 1967, Boston College; M.D. 1971, Tufts University

Glenn Geelhoed, *Assistant in Surgery*
B.A. 1964, B.S. 1965, Calvin College; M.D. 1968, University of Michigan

John Paul Gens, Jr., *Assistant in Surgery*
B.S. 1967, Trinity College, Connecticut; M.D. 1971, George Washington University

Gary Gerstein, *Assistant in Medicine (Hematology)*
B.S. 1969, St. Joseph's College, Pennsylvania; M.D. 1973, Jefferson Medical College

Ingrid Ehrmann Gheen, *Assistant in Physical Medicine and Rehabilitation*
M.D. 1971, Maximillian University, Germany

Joseph Gisanrin, *Assistant in Pediatrics*
M.B., B.S. 1968, University of Ibadan, Nigeria

Robert Jay Glowitz, *Assistant in Pathology*
B.S. 1967, University of Maryland; M.D. 1971, George Washington University

Kenneth Goldberg, *Assistant in Urology*
B.A. 1970, George Washington University; M.D. 1974, Case Western Reserve University

Richard Golding, *Assistant in Medicine*
B.S. 1971, Albright College; M.D. 1975, Temple University

Howard Goldstein, *Assistant in Medicine (Cardiology)*
B.A. 1967, Colgate University; M.D. 1971, George Washington University

Richard Dennis Gordon, *Assistant in Medicine*
B.S. 1973, Pennsylvania State University; M.D. 1975, Jefferson Medical College

Barbara Ann Gots, *Assistant in Ophthalmology*
B.A. 1964, Temple University; M.D. 1973, University of Southern California

James Graeter, *Assistant in Orthopaedic Surgery*
B.S. 1970, M.D. 1974, Georgetown University

Jay Gross, *Assistant in Ophthalmology*
B.A. 1968, Gettysburg College; M.D. 1974, Union College and University, Albany Medical College

Nadim Rizeq Habash, *Assistant in Ophthalmology*
M.B., Ch.B. 1971, Baghdad University, Iraq

Joyce Piccario Hair, *Assistant in Obstetrics and Gynecology*
B.A. 1970, Hood College; M.D. 1974, George Washington University

Stephen Keith Hall, *Assistant in Medicine*
B.A. 1971, Davidson College; M.D. 1975, Temple University

William Henry Hall, *Assistant in Ophthalmology*
M.D. 1975, State University of New York at Buffalo

Ernest Dalton Hanowell, *Assistant in Surgery*
B.S. 1969, University of California, Davis; M.D. 1973, George Washington University

Denis Robert Harris, *Assistant in Orthopaedic Surgery*
B.S. 1968, M.D. 1972, University of Wisconsin—Madison

Harvey Hechel, *Assistant in Medicine*
B.S. 1965, City University of New York, Brooklyn College; M.D. 1969, New York State University Downstate Medical Center

Clara Szczupak Heffess, *Assistant in Pathology*
M.D. 1965, University of Buenos Aires, Argentina

Roberta Katlin Helfgott, *Assistant in Radiology*
B.S. 1968, Simmons College; M.D. 1972, George Washington University

Maria Rita Hernando, *Assistant in Pathology*
B.S. 1965, M.D. 1970, University of Santo Tomas, Philippines

William Holland Heron, *Assistant in Anesthesiology*
B.A. 1971, Johns Hopkins University; M.D. 1975, George Washington University

Bruce William Hinrichs, *Assistant in Anesthesiology*
B.S. 1968, Marquette University; M.D. 1972, Medical College of Wisconsin

Florie Hirsch, *Assistant in Obstetrics and Gynecology*
B.A. 1970, Columbia University; M.D. 1974, George Washington University

John Craig Holland, *Assistant in Medicine*
B.A. 1971, M.D. 1975, University of Colorado

William Stephen Hood, *Assistant in Medicine (Cardiology)*
B.A. 1969, Drew University; M.D. 1973, University of Maryland

Steven Blair Hopping, *Assistant in Surgery*
B.A. 1971, Brown University; M.D. 1975, University of Cincinnati

Douglas Robert Howard, *Assistant in Orthopaedic Surgery*
B.S. 1970, Brown University; M.D. 1974, George Washington University

William Eliot Hurwitz, *Assistant in Medicine*
B.A. 1966, Columbia College; M.A. 1971, M.D. 1971, Stanford University

Paul Jeffrey Isaacson, *Assistant in Surgery*
B.A. 1970, Johns Hopkins University; M.D. 1974, George Washington University

Thomas Nedumparambil Jacob, *Assistant in Psychiatry and Behavioral Sciences*
M.D. 1970, Christian Medical College, India

Lawrence Milton Jacoby, *Assistant in Dermatology*
B.A. 1968, Syracuse University; M.D. 1973, College of Medicine and Dentistry of New Jersey New Jersey Medical School

Daniel Estabillo Jimenez, *Assistant in Radiology*
B.S. 1968, University of the Philippines; M.D. 1973, University of the East, Philippines

David Johnson, *Assistant in Orthopaedic Surgery*
B.S. 1969, M.D. 1973, Yale University

Dennis Robert Johnson, *Assistant in Obstetrics and Gynecology*
B.S. 1969, St. Joseph's College, Pennsylvania; M.D. 1973, University of North Carolina

Daniel Katcher, *Assistant in Medicine (Hematology)*
B.S. 1968, University of Pittsburgh; M.D. 1972, University of Vermont

Harvey Irwin Katzen, *Assistant in Medicine*
B.S. 1972, Georgetown University; M.D. 1975, George Washington University

Nguyen Quoc Khoa, *Assistant in Pathology*
M.D. 1972, Saigon University, Vietnam

Nigar Kirmani, *Assistant in Medicine (Infectious Diseases)*
M.B.B.S. 1973, King Edward Medical College, Pakistan

George Franklin Kish, *Assistant in Thoracic Surgery*
B.S. 1966, M.D. 1970, Ohio State University

John Walter Klousia, *Assistant in Urology*
B.A. 1967, Cornell College; M.D. 1971, University of Virginia

William Knaus, *Assistant in Medicine*
B.S. 1968, Widener College; M.D. 1972, West Virginia University

Gregory Koons, *Assistant in Obstetrics and Gynecology*
B.A. 1969, Gettysburg College; M.D. 1973, Georgetown University

Stephen Jeffrey Kornfeld, *Assistant in Medicine*
B.S. 1971, Union College and University; M.D. 1975, Cornell University

Robert Kornfield, *Assistant in Medicine (Gastroenterology)*
B.A. 1967, Boston University; M.D. 1971, Georgetown University

Katalin Korossy, *Assistant in Dermatology*
M.D. 1970, Debrecen Medical University, Hungary

Bruce Kressel, *Assistant in Medicine (Hematology)*
B.A. 1969, Lafayette College; M.D. 1973, Tufts University

Donald William Kufe, *Assistant in Medicine*
B.A. 1966, Bowdoin College; M.D. 1970, University of Rochester

Kerry Lee Kuhn, *Assistant in Obstetrics and Gynecology*
B.A. 1970, M.D. 1974, George Washington University

Stewart Zane Kupetz, *Assistant in Dermatology*
B.A. 1969, University of Michigan; M.D. 1973, Georgetown University

William Arnold Lambeth III, *Assistant in Surgery*
B.A. 1967, University of the South; M.D. 1971, University of North Carolina at Chapel Hill

Jeffrey H. Lane, *Assistant in Obstetrics and Gynecology*
B.A. 1971, University of Rochester; M.D. 1975, Union College and University, Albany Medical College

Carl Lederman, *Assistant in Radiology*
B.A. 1968, University of Rochester; M.D. 1972, Albert Einstein College of Medicine

Christopher Leet, *Assistant in Medicine (Cardiology)*
B.S. 1968, George Washington University; M.D. 1972, Medical College of Georgia

James Leffers, Jr., *Assistant in Orthopaedic Surgery*
B.A. 1969, Vanderbilt University; M.D. 1973, University of Tennessee Medical Units

Robert Howard Levitt, *Assistant in Obstetrics and Gynecology*
B.A. 1968, M.D. 1972, State University of New York at Buffalo

Arnold Levy, *Assistant in Medicine (Gastroenterology)*
B.A. 1968, M.D. 1971, George Washington University

Michael Elliot Lewis, *Assistant in Medicine*
B.A. 1971, University of Pennsylvania; M.D. 1975, College of Medicine and Dentistry of New Jersey, New Jersey Medical School

Richard Lewis, *Assistant in Orthopaedic Surgery*
B.A. 1966, City University of New York, Queens College; M.D. 1970, George Washington University

Joseph David Linehan, *Assistant in Orthopaedic Surgery*
B.A. 1966, University of Virginia; M.D. 1970, Medical College of Virginia of Virginia Commonwealth University

Edward Robert Lipsit, *Assistant in Radiology*
B.A. 1971, Yeshiva University; M.D. 1975, Georgetown University

David Martin Liverett, *Assistant in Surgery*
B.A. 1969, New York University; M.D. 1973, George Washington University

Dorcas Joanne Lynn, *Assistant in Medicine*
B.S. 1970, Dickinson College; M.D. 1974, Boston University

David Lyons, *Assistant in Orthopaedic Surgery*
B.A. 1965, Yale University; M.B.A. 1967, Harvard University; M.D. 1973, Columbia University

Steven Daniel Macht, *Assistant in Surgery*
B.S. 1965, D.D.S. 1969, University of Maryland; M.D. 1972, George Washington University

Nicholas Harry Malakis, *Assistant in Radiology*
M.D. 1970, University of Toronto

John Roger Maloney, *Assistant in Psychiatry and Behavioral Sciences*
B.A. 1968, North Carolina State University; M.D. 1972, Temple University

Robert Ara Mangasarian, *Assistant in Radiology*
B.A. 1971, Boston University; M.D. 1975, George Washington University

Randall Jay Margolis, *Assistant in Pathology*
B.A. 1971, Miami University; M.D. 1975, Ohio State University

Sharon Louise Landman Marselas, *Assistant in Neurological Surgery*
B.A. 1968, St. John's College, Maryland; M.D. 1972, University of Maryland

Warren Clark Marshall II, *Assistant in Plastic Surgery*
B.S. 1966, Pennsylvania State University; M.D. 1970, George Washington University

Bernard Arthur Mason, *Assistant in Medicine (Hematology)*
B.A. 1968, M.D. 1972, University of Pennsylvania

Martin Michael May, *Assistant in Orthopaedic Surgery*
B.A. 1969, Syracuse University; M.D. 1974, The University of Health Sciences/Chicago Medical School

Frank Joseph Mayo, *Assistant in Medicine*
B.A. 1970, Denison University; M.D. 1973, Ohio State University

Steven Mazer, *Assistant in Orthopaedic Surgery*
B.A. 1970, Boston University; M.D. 1974, Georgetown University

Cavert Keith McCorkle, *Assistant in Neurological Surgery*
B.S. 1968, Clemson University; M.D. 1972, Medical University of South Carolina

Joseph Paul McCormick, *Assistant in Surgery*
B.A. 1969, Alfred University; M.D. 1974, George Washington University

George Morris McCullars, *Assistant in Pathology*
B.S. 1967, University of Florida; M.S. 1971, M.Phil. 1974, Ph.D., M.D. 1975, George Washington University

Donald McNellis, *Assistant in Surgery*
B.S. 1969, Rutgers—The State University (New Brunswick); M.D. 1975, Medical College of Wisconsin

Frank Melograna, Jr., *Assistant in Surgery*
B.S. 1971, Tufts University; M.D. 1975, Temple University

William Alvin Meyer, Jr., *Assistant in Obstetrics and Gynecology*
M.D. 1974, Thomas Jefferson University

Kenneth Alan Miller, *Assistant in Medicine*
M.M.S. 1973, College of Medicine and Dentistry of New Jersey, Rutgers Medical School; M.D. 1975, Rush Medical College

Nooreddin Mirmirani, *Assistant in Psychiatry and Behavioral Sciences*
M.D. 1970, Tehran University

Stefan-Dinu Miron, *Assistant in Radiology*
M.D. 1960, Medico-Pharmaceutical Institute, Hungary

Neville Mirza, *Assistant in Neurological Surgery*
M.B., B.S. 1971, Seth G. S. Medical College, India

Shiela Craig Smith Mitchell, *Assistant in Pediatrics*
M.D. 1951, University of Toronto; M.P.H. 1960, University of Michigan

Sigmund Mittler, *Assistant in Radiology*
M.D. 1964, Central University of Venezuela

John Barber Mueller, *Assistant in Medicine*
B.A. 1971, University of Rochester; M.D. 1975, Albany Medical College

Anne Lane Murray, *Assistant in Anesthesiology*
B.A. 1971, Catholic University; M.D. 1975, New Jersey College of Medicine and Dentistry, New Jersey Medical School

Keith Henderson Neblett, *Assistant in Obstetrics and Gynecology*
B.S. 1970, M.D. 1974, Howard University

Clark Michael Neuwelt, *Assistant in Medicine*
B.S. 1971, University of Wisconsin; M.D. 1975, George Washington University

Alan Ney, *Assistant in Medicine*
B.S. 1971, St. Lawrence University; M.D. 1975, George Washington University

Frank Niechniedowicz, *Assistant in Anesthesiology*
B.S. 1970, St. John's University; M.D. 1975, George Washington University

Mary Ann Nirdlinger, *Assistant in Anesthesiology*
B.A. 1971, Wellesley College; M.D. 1975 , University of Illinois at the Medical Center

Steven Joel Nussbaum, *Assistant in Medicine*
B.S. 1970, Union College, New York; M.D. 1974, State University of New York Downstate Medical Center

Jay Alan Ocuin, *Assistant in Medicine (Renal Diseases)*
B.A. 1964, University of Vermont; M.D. 1971, University of Bologna, Italy

George Orr, *Assistant in Medicine*
B.S. 1971, M.D. 1975, University of Pittsburgh

Jose Ortiz, *Assistant in Anesthesiology*
M.D. 1967, School of Medicine IPN, Mexico

Richard Nash Palmer, *Assistant in Pathology*
B.S. 1970, New Mexico State University; M.D. 1975, George Washington University

Gary Kazimieras Palys, *Assistant in Psychiatry and Behavioral Sciences*
B.S. 1969, St. John's University, New York; M.D. 1973, State University of New York at Buffalo

Steven William Papish, *Assistant in Medicine*
B.A. 1970, M.D. 1974, University of Pennsylvania

Soo Woong Park, *Assistant in Medicine (Renal Diseases)*
M.D. 1969, Seoul National University

Matthew Allen Parker, *Assistant in Medicine*
B.A. 1971, University of Rochester; M.D. 1975, New York Medical College

William Charles Payes, *Assistant in Anesthesiology*
B.S. 1970, Syracuse University; M.D. 1974, George Washington University

James Lawrence Pearle, *Assistant in Medicine*
B.A. 1969, University of Chicago; M.D. 1973, New York Medical College

Kent Peterson, *Assistant in Medicine*
B.A. 1964, University of North Carolina; M.D. 1968, University of Pennsylvania

Stephen Donohoe Pett, *Assistant in Surgery*
B.S. 1967, Seton Hall University; M.D. 1971, George Washington University

Harold Alan Pincus, *Assistant in Psychiatry and Behavioral Sciences*
B.A. 1972, University of Pennsylvania; M.D. 1975, Albert Einstein College of Medicine

Peter Charles Pislor, *Assistant in Pathology*
B.S. 1970, Villanova University; M.D. 1974, College of Medicine and Dentistry of New Jersey New Jersey Medical School

Ungkab Prakanrattana, *Assistant in Anesthesiology*
M.D. 1972, Mahidol University, Thailand

John Elliot Pressler, *Assistant in Surgery*
B.S. 1969, University of Michigan; M.D. 1973, Ohio State University

Armand Joseph Pulcinella, *Assistant in Pediatrics*
B.S. 1969, St. Joseph's College, Pennsylvania; M.D. 1973, Creighton University

Nandhaka Punyindu, *Assistant in Medicine (Renal Diseases)*
M.D. 1970, Mahidol University, Thailand

Eugenia Jose Quintos, *Assistant in Pathology*
M.D. 1962, University of Santo Tomas, Philippines

Rodwan Rajjoub, *Assistant in Neurological Surgery*
M.D. 1972, Damascus University, Syria

Marco Ramos, *Assistant in Neurological Surgery*
M.D. 1971, San Marcos University, Peru

Avvari Rangaswamy, *Assistant in Radiology*
M.B., B.S. 1970, Post Graduate Medical Institute, India

Khosrow Rastgar, *Assistant in Pathology*
B.S. 1964, M.D. 1968, Pahlevi University, Iran

Richard Brian Reff, *Assistant in Orthopaedic Surgery*
B.A. 1969, M.D. 1972, George Washington University

Richard Kenneth Riegelman, *Assistant in Medicine*
M.D. 1973, University of Wisconsin—Madison; M.P.H. 1975, Johns Hopkins University

Stephen Jay Rockower, *Assistant in Surgery*
B.S. 1971, Muhlenberg College; M.D. 1975, Temple University

Deborah Susan Rogers, *Assistant in Psychiatry and Behavioral Sciences*
B.S. 1973, Rensselaer Polytechnic Institute; M.D. 1973, Union College and University, Albany Medical College

Michael Ross, *Assistant in Obstetrics and Gynecology*
B.S. 1971, Dickinson College; M.D. 1975, George Washington University

Barry Stephen Rothman, *Assistant in Obstetrics and Gynecology*
B.A. 1971, M.D. 1975, George Washington University

Bruce Rubin, *Assistant in Radiology*
B.S. 1964, City University of New York, City College; M.D. 1968, Columbia University

Jo-Anne Ruby, *Assistant in Anesthesiology*
B.S. 1967, M.D. 1974, George Washington University

Maria Rueda-Pedraza, *Assistant in Pathology*
M.D. 1963, National University of Mexico Faculty of Medicine

Patricia Ann Holly Russell, *Assistant in Anesthesiology*
M.D. 1957, Emory University

Reza Sabet, *Assistant in Neurology*
M.D. 1971, Tehran University, Iran

Vinayak Mahadeo Sabnis, *Assistant in Surgery*
M.B.B.S. 1972, Bombay University College of Medicine, India

Nabih H. Sader, *Assistant in Plastic Surgery*
M.D. 1971, Faculty of Medicine, Lebanon

Julian Edwin Safran, *Assistant in Obstetrics and Gynecology*
B.A. 1972, M.D. 1975, George Washington University

Saad Al Sakkal, *Assistant in Medicine (Endocrinology)*
M.D. 1972, Damascus University, Syria

Robert Sandler, *Assistant in Medicine*
B.S. 1971, Union College, New York; M.D. 1975, Yale University

Mark Neal Scheinberg, *Assistant in Obstetrics and Gynecology*
B.A. 1969, Syracuse University; M.D. 1973, State University of New York at Buffalo

David Schoening, *Assistant in Medicine (Cardiology)*
B.A. 1968, Pacific Lutheran University; M.D. 1972, University of Oregon

John Edward Schultz, Jr., *Assistant in Dermatology*
B.S. 1970, Juniata College; D.O. 1974, Philadelphia College of Osteopathic Medicine

Anthony Robert Scialli, *Assistant in Obstetrics and Gynecology*
B.S. 1971, Rensselaer Polytechnic Institute; M.D. 1975, Union College and University, Albany Medical College

Richard Nathaniel Scott, *Assistant in Thoracic Surgery*
B.A. 1963, Lincoln University; M.D. 1967, Howard University

Thomas Walter Scott, *Assistant in Obstetrics and Gynecology*
B.S. 1969, M.D. 1975, George Washington University

A. Safa Sheikhouni Sergie, *Assistant in Clinical Engineering*
M.D. 1973, Faculty of Medicine, Aleppo, Syria

Mohammad Shafiei, *Assistant in Neurology*
M.D. 1971, Tehran University, Iran

Jay Shapiro, *Assistant in Medicine (Endocrinology)*
B.S. 1953, Franklin and Marshall College; M.D. 1957, Boston University

Hillard Caroll Sharf, *Assistant in Medicine*
B.S. 1971, Carnegie-Mellon University; M.D. 1975, Hahnemann Medical College

Barbara Sherwin, *Assistant in Medicine (Hematology)*
B.S. 1959, Antioch College; M.D. 1967, George Washington University

Ali Shirkhoda, *Assistant in Radiology*
M.D. 1970, Isfahan Medical School, Iran

Lester Steven Shoap, *Assistant in Medicine*
M.D. 1970, Temple University

Ravinder Singh, *Assistant in Pathology*
M.B.B.S. 1971, Maulana Azad Medical College, India

Arye Nordstein Snir, *Assistant in Obstetrics and Gynecology*
M.D. 1971, Tel Aviv University

Steven Bennett Sotman, *Assistant in Medicine*
B.S. 1970, M.D. 1973, Tulane University

Chariklia Spiegel, *Assistant in Medicine*
B.A. 1969, University of California, Berkeley; M.D. 1973, University of California, San Francisco

Arthur Charles St. Andre, *Assistant in Medicine*
B.S. 1971, University of Notre Dame; M.D. 1975, Jefferson Medical College

Betty Lynn Staton, *Assistant in Psychiatry and Behavioral Sciences*
B.A. 1970, Austin College; M.D. 1974, University of Texas at San Antonio

Grace Gabe Steinberg, *Assistant in Neurology*
B.A. 1955, Radcliffe College; M.D. 1959, Boston University

Paul Jay Steinberg, *Assistant in Psychiatry*
B.A. 1970, University of Pennsylvania; M.D. 1974, State University of New York Downstate Medical Center

Roger Stevenson, Jr., *Assistant in Medicine (Cardiology)*
M.D. 1972, University of Texas at San Antonio

Thomas Fildane Street, *Assistant in Surgery*
B.S. 1968, John Carroll University; M.D. 1972, George Washington University

Auraya Kiriwat Suriya, *Assistant in Anesthesiology*
M.D. 1970, Mahidol University, Thailand

Nancy Marianne Dames Sweet, *Assistant in Medicine*
B.S. 1969, Chestnut Hill College; M.D. 1975, George Washington University

Celeste Szewczyk, *Assistant in Medicine*
B.S. 1975, Rensselaer Polytechnic Institute; M.D. 1975, Union College and University, Albany Medical College

Unnur Petursdottir Thorgeirsson, *Assistant in Pathology*
M.D. 1969, University of Iceland

Richard Travers, *Assistant in Medicine (Gastroenterology)*
B.A. 1967, M.D. 1971, Yale University

James Craig Van Elswyk, *Assistant in Obstetrics and Gynecology*
B.S. 1971, Wheaton College, Illinois; M.D. 1975, College of Medicine and Dentistry of New Jersey

Linda Reid Van Leeuwen, *Assistant in Pediatrics*
B.A. 1967, University of Missouri; M.D. 1974, University of Nebraska Medical Center

Michael Veeder, *Assistant in Medicine*
B.A. 1971, Boston College; M.D. 1975, Yale University

Boris Alexander Vern, *Assistant in Neurology*
B.S. 1968, Ph.D. 1971, M.D. 1972, Northwestern University

Renu Virmani, *Assistant in Pathology*
M.B., B.S. 1967, Maulana Azad Medical College, India; M.D. 1973, Lady Hardinge Medical College, India

Haven Neill Wall, Jr., *Assistant in Medicine (Cardiology)*
B.S. 1965, Marshall University; M.D. 1969, University of Maryland

John Alan Walsh, *Assistant in Surgery*
B.S. 1970, Villanova University; M.D. 1975, Union College and University, Albany Medical College

Allen Curtis Waltman, *Assistant in Health Care Sciences*
B.A. 1968, Lafayette College; M.D. 1973, Boston University

Richard James Warchol, *Assistant in Medicine (Endocrinology)*
B.A. 1967, Millikin University; M.D. 1972, George Washington University

Kenneth Ward, *Assistant in Orthopaedic Surgery*
B.A. 1969, Northwestern University; M.D. 1973, College of Medicine and Dentistry of New Jersey

Alan Gary Wasserman, *Assistant in Medicine (Cardiology)*
B.A. 1969, Rutgers--The State University; M.D. 1973, Hahnemann Medical College

Jay Harlan Weiner, *Assistant in Medicine*
B.A. 1971, M.D. 1975, George Washington University

Robert Adams Weiss, *Assistant in Medicine*
B.A. 1970, Yale University; M.D. 1974, University of Pennsylvania

Paul Howard Weisshaar, *Assistant in Obstetrics and Gynecology*
B.A. 1967, State University of New York at Binghamton; M.D. 1975, College of Medicine and Dentistry of New Jersey, New Jersey Medical School

William Wheeler, *Assistant in Radiology*
B.S. 1971, American University; M.D. 1975, University of Virginia

Kenneth Heaton Wilson, *Assistant in Medicine*
B.A. 1970, M.D. 1974, University of North Carolina at Chapel Hill

Leonard Arthur Wisneski, *Assistant in Medicine*
B.S. 1969, Drexel University; M.D. 1973, Thomas Jefferson University

Anne Woods, *Assistant in Neurology*
M.B., B.S. 1970, University of N.S.W. Medical Faculty, Australia

Kae Strosnider Yingling, *Assistant in Radiology*
B.S. 1969, University of Maryland; M.D. 1973, George Washington University

Grace Young, *Assistant in Psychiatry and Behavioral Sciences*
M.D. 1966, University of Michigan

Robert David Zimmerman, *Assistant in Radiology*
B.A. 1968, Rutgers—The State University (New Brunswick); M.D. 1972, Albert Einstein College of Medicine

Stefan Zineski, *Assistant in Medicine*
B.A. 1971, M.D. 1975, Wayne State University

David Mark Zwerdling, *Assistant in Psychiatry and Behavioral Sciences*
B.A. 1965, Harvard University; J.D. 1969, University of Chicago; M.D. 1975, Yale University

Alan Robert Zwerner, *Assistant in Obstetrics and Gynecology*
B.A. 1970, State University of New York at Buffalo; M.D. 1974, Georgetown University



MEDICAL STUDENT RECORD

M.D. Degree Candidates Registered 1976–77

First Year

Abokocole, Georgiana — Sierra Leone
B.S. 1970, Ph.D. 1973, Howard University

Adkins, Mark — Md.
B.A. 1976, University of North Carolina

Adler, Alf — P.R.
B.A. 1976, Washington University

Allchin, Carol — Va.
B.S. 1973, Allegheny College;
M.S. 1974, University of Illinois

Ammerman, Seth — Md.
B.S. 1976, Tufts University

Amsterdam, Diane — N.Y.
B.A. 1971, Vassar College

Ardill, William — N.J.
B.S. 1974, Ursinus College

Baehler, Elizabeth — N.Y.
B.S. 1962, St. Johns University;
M.S. 1968, Fordham University

Bagley, Peter — Calif.
B.A. 1975, Columbia University

Bamberger, Mark — Calif.
B.A. 1976, Stanford University

Band, David — Pa.
B.A. 1975, University of Pennsylvania

Bandel, Donald — N.Y.
B.A. 1968, Queens College, M.A. 1971,
New York University

Barkovich, Anthony — Calif.
B.S. 1974, University of California, Davis

Barnard, Neal — N.D.
B.A. 1975, Macalester College

Baugh, James — Calif.
B.A. 1976, Stanford University

Baum, Anna — Calif.
B.A. 1976, University of California,
Los Angeles

Bensky, Norman — Mass.
B.S. 1975, Syracuse University

Bernstein, Zale — N.Y.
B.S. 1976, Columbia University

Bombard, Allan — Va.
B.A. 1975, Colgate University

Boyd, Calvin — Mich.
B.A. 1974, University of Colorado

Boyd, Cynthia
B.A. 1976, University of Colorado

Bridge, Raymond
B.S. 1972, Westminster College;
M.H. 1975, University of Pittsburgh

Brigham, Peter
B.A. 1970, Harvard University

Brin, Steven
B.A. 1973, New York University

Brockbank, Keven
B.S. 1976, University of Utah

Brodie, Stephan
B.S. 1974, George Washington University

Bronsteen, Richard
B.A. 1975, University of Rochester

Burket, Roger
B.S. 1971, Pennsylvania State University

Butler, Marjorie
B.S. 1976, Howard University

Capron, Theodore
B.A. 1976, University of Virginia

Charytan, Morris
B.A. 1976, Yeshiva University

Cohen, Steven
B.A. 1976, Emory University

Comstock, Gary
B.S. 1975, University of California,
Davis

Convit, Rafael
B.S. 1975, George Washington University

Cope, Gerry
B.S. 1969, University of Utah

Costa, Leon
B.A. 1976, Princeton University

Crawford, Bernard
B.A. 1972, Wesleyan University

Cuthbertson, Rand
B.S. 1976, U.S. Military Academy

DelPiero, Eric
B.A. 1975, Johns Hopkins University

Diener, Howard
B.S. 1976, George Washington University

Dietrich, Robert
B.S. 1975, University of Maryland

Donovan, Scott — Ill.
B.S. 1975, Valparaiso University
Donowitz, Arlene — N.J.
B.S. 1976, University of Michigan
Early, Susan — Va.
B.S. 1974, College of William and Mary
Eaton, Barbara — Va.
B.S. 1974, Tufts University
Emmel, Alfred — Conn.
B.S. 1976, Colorado State University
Endicott, Mark — Calif.
B.S. 1976, University of California, Davis
Enomoto, Kim — Miss.
B.S. 1975, Tufts University
Erickson, John — Mass.
B.A. 1976, Bowdoin College
Farr, Charles — N.Y.
B.A. 1971, Hamilton College
Filak, Michael — N.J.
B.A. 1976, College of the Holy Cross
Fine, Betsy — Md.
B.A. 1975, Smith College
Frank, Lawrence — N.Y.
B.A. 1976, Dartmouth College
Franklin, David — Wash.
B.S. 1976, Yale University
Frost, Mary — Md.
B.A. 1976, University of Maryland
Gil, Kevin — N.Y.
B.S. 1976, State University of New York at Stony Brook
Giokas, George — Mass.
B.A. 1975, Tufts University
Glick, Dennis — Md.
B.A. 1971, University of Rochester; M.A. 1973, New York University
Goddard, Joseph — Tenn.
B.A. 1976, Vanderbilt University
Goldstein, Sandra — N.Y.
B.A. 1970, George Washington University M.S. 1972, Columbia University
Green, Frederick — Conn.
B.A. 1974, Yale University
Gusack, Mark — Md.
B.A. 1976, Amherst College
Hamill, Robin — N.J.
B.A. 1974, Colby College
Handte, Gordon — Md.
B.A. 1972, University of Maryland
Hanseen, Ross — Calif.
B.S. 1976, University of Utah
Heffernan, John — Md.
B.S. 1972, Duke University; M.S. 1974, Rutgers—The State University
Heitner, Mark — Ohio
B.A. 1976, Connecticut College
Hindman, Donald — Md.
B.A. 1971, Kent State University
Hoffman, Wayne — N.J.
B.S. 1976, Duke University
Holmes, Joye — Tenn.
B.S. 1975, Yale University
Hunt, Lyle — Utah
B.A. 1976, Weber State College
Jackson, Jane — Md.
B.S. 1976, Howard University
Jacobs, Theodolph — N.Y.
B.A. 1970, Cornell, University; M.A. 1973, University of Massachusetts
Judson, Patrick — D.C.
Karefasmart, Suzanne — Mass
B.A. 1976, Radcliffe College

Kaufman, Peter — N.Y.
B.S. 1976, Massachusetts Institute of Technology
Kerney, Suzanne — Md.
B.S. 1976, Muhlenberg College
Kinsman, Robert — Calif.
B.A. 1976, University of California, Davis
Kleinerman, Deena — Md.
B.A. 1975, Case Western Reserve University
Kleinman, Carol — Md.
B.A. 1966, Northwestern University; J.D. 1969, George Washington University
Klos, Tina — D.C.
B.S. 1969, M.S. 1972, George Washington University
Knowlan, Michael — D.C.
B.S. 1973, Georgetown University
Kovar, Richard — N.J.
B.A. 1976, University of Rochester
Krucoff, Mitchell — D.C.
B.A. 1976, Yale University
Law, Thomas — Md.
B.A. 1974, University of Maryland
Lee, James — Md.
B.A. 1976, Kalamazoo College
Lemons, Richard — Md.
B.A. 1968, University of Connecticut; Ph.D. 1973, Pennsylvania State University
Lever, David — Pa.
B.S. 1976, University of Pittsburgh
Lewis, Ronald — Md.
B.S. 1975, Pennsylvania State University
Libow, Lester — N.Y.
B.A. 1976, City University of New York, Queens College
Linn, David — N.C.
B.S. 1969, University of Dayton; Ph.D. 1974, University of Arizona
Lyons, David — Mich.
B.A. 1976, Albion College
Marando, Rocco — N.Y.
B.S. 1976, St. John's University
Martin, Alison — D.C.
B.A. 1972, New York University
Matthews, Lisa — Calif.
B.A. 1976, Princeton University
McGuire, James — Md.
B.S. 1975, George Washington University
McNamara, John — Va.
B.S. 1971, Marquette University
Mendelsohn, Craig — Md.
B.A. 1976, Emory University
Millen, Mark — Conn.
B.A. 1974, Clark University
Morse, Melvin — Md.
B.A. 1975, Johns Hopkins University
Murphy, Brian — Md.
B.A. 1976, Yale University
Myers, James — Md.
B.S. 1975, Duke University
Myers, Joyce — Va.
B.A. 1969, Duke University; Ph.D. 1974, Johns Hopkins University
Nelson, Mark — Mich.
B.S. 1969, M.S. 1973, Wayne State University
Norman, Donald — Mich
B.S. 1976, University of Michigan
O'Neill, William — Md.
B.A. 1972, Tulane University
Oseroff, Allen — Md.
B.S. 1975, University of Michigan

Pandina, Russell N.Y.
B.S. 1967, Oklahoma State University; M.S. 1969, University of Illinois

Patterson, Joseph N.M.
B.S. 1970, U.S. Military Academy

Ramee, Stephen Ga.
B.A. 1974, Vanderbilt University

Randazzo, Richard Mass.
B.A. 1973, Colby College; M.S. 1975, George Washington University

Reizner, George Mich.
B.S. 1976, University of Michigan

Ritter, Jeffrey N.Y.
B.S. 1975, Yale University

Roberts, Richard Wis.
B.A. 1975, University of Wisconsin

Rodman, Willima Ohio
B.S. 1974, Mount Union College

Rogers, Philip Md.
B.S. 1976, Johns Hopkins University

Roistacher, Richard Ill.
B.A. 1975, Knox College

Rosenberg, Jerrold Mass.
B.A. 1976, Brandeis University

Rothberg, Robert Mo.
B.A. 1973, American University

Sapp, John Maine
B.A. 1975, University of Maine

Sargent, Steven Mass.
B.A. 1975, Dartmouth College

Sarnoff, Deborah N.Y.
B.A. 1975, Cornell University

Saxey, Roderick Ore.
B.S. 1974, Brigham Young University

Scheele, Drew Va.
B.A. 1970, University of Virginia

Seago, Randall Calif.
B.S. 1976, Loyola University of Los Angeles

Segal, Barbara Minn.
B.A. 1970, University of Minnesota

Seigel, Mark N.Y.
B.S. 1975, State University of New York at Binghamton

Shapiro, Jo N.Y.
B.A. 1975, Cornell University

Sinkoff, Mark Mich.
B.S. 1974, University of Michigan

Slawsky, Richard Md.
B.A. 1974, Swarthmore College; M.S. 1975, University of Maryland

Smith, George Calif.
B.A. 1972, University of California, Berkeley

Smith, Jean D.C.
B.S. 1965, Howard University; M.S. 1970, University of Maryland

Smith, Joseph Pa.
B.S. 1974, George Washington University

Southwick, Steven Conn.
B.A. 1974, Yale University

Stanton, Thomas Calif.
B.A. 1975, University of California, Berkeley

Sunkin, Arthur Va.
B.S. 1974, George Washington University

Tomlinson, Elizabeth Pa.
B.A. 1975, St. John's College

Tupling, Mary D.C.
B.S. 1974, George Washington University

Wand, Gary N.Y.
B.A. 1975, Skidmore College

Warren, Claire D.C.
B.A. 1975, Boston University

Wedmid, Rosalie N.J.
B.A. 1976, Princeton University

Weil, Lawrence Vt.
B.S. 1970, Babson College

Weisser, Rick Calif.
B.S. 1975, Stanford University

Weller, Marc Md.
B.S. 1976, George Washington University

Westrom, Dale Calif.
B.S. 1969, University of California, Davis
Ph.D. 1975, University of California, Berkeley

Wiedman, Margaret Calif.
B.A. 1976, University of California, Berkeley

Wilckens, John N.Y.
B.S. 1976, U.S. Naval Academy

Williams, Margo N.Y.
B.A. 1969, Marquette University; M.A. 1975, City University of New York, Hunter College

Wilson, William Wash.
B.S. 1972, U.S. Military Academy

Yackee, John D.C.
B.A. 1975, Ithaca College

Yalom, Eve Calif.
B.S. 1976, Stanford University

Yee, John Ohio
B.A. 1975, Columbia University

Second Year

Alves, John N.J.
B.A. 1974, B.S. 1975, George Washington University

Anderson, Eric N.Y.
B.S. 1975, Stanford University

Anderson, Gordon Calif.
B.A. 1971, B.S. 1974, University of California

Austin, Cynthia Calif.
B.A. 1975, Boston University

Barnhart, Scott Ariz.
B.A. 1973, St. Lawrence University

Barron, David N.Y.
B.S. 1974, George Washington University

Bate, David N.J.
B.A. 1969, Hamilton College

Bean, Robert Maine
B.A. 1966, University of Maine

Beck, Clifford Md.
B.A. 1973, New York University

Beckom, Deborah Calif.
B.A. 1975, University of California, Santa Barbara

Beecher, Patrick Wash.
B.S. 1973, 1975, University of Washington

Bernstein, Deborah N.Y.
B.A. 1975, Princeton University

Boone, Lynne D.C.
B.S. 1969, Pennsylvania State University
M.A. 1973, University of Texas

Boyd, Tyrone — Md.
B.S. 1974, Howard University

Bradley, Linda — Minn.
B.A. 1974, Miami University

Brettholtz, Edward — N.Y.
B.S. 1975, George Washington University

Bronstein, Scott — N.Y.
B.A. 1975, Hamilton College

Brown, Carin — D.C.
B.A. 1968, Macalester College

Brown, Michele — N.Y.
B.S. 1975, Tufts University

Bullock, Thomas — Ohio
B.A. 1974, Kenyon College

Chapman, Edward — Mass.
B.S. 1974, University of New Hampshire

Chen, Thomas — Taiwan
B.A. 1973, Lake Forest College
M.S. 1975, George Washington University

Claudy, Frank — D.C.
B.S. 1975, George Washington University

Cohen, Laura — Ind.
B.S. 1971, Indiana University

Consalvo, John — N.J.
B.A. 1975, Rutgers University

Coultrip, Laura — Kan.
B.A. 1975, University of Kansas

Del Gaizo, Christine — N.Y.
B.A. 1975, City University of New York, Hunter College

Dewell, James — Calif.
B.A. 1975, Stanford University

Dimitri, Dennis — Mass.
B.A. 1975, Clark University

Dubose, Martina — Md.
B.S. 1975, Howard University

Dunn, Neal — Va.
B.S. 1975, Washington and Lee University

Duval, Georges — Pa.
B.S.M.E. 1963, M.S.M.E. 1966, Massachusetts Institute of Technology

Elliott, William — Calif.
B.A. 1975, Stanford University

Epstein, Todd — Md.
B.S. 1975, Washington University

Erteschik, Nathan — N.Y.
B.S. 1975, George Washington University

Feder, Mary — Calif.
B.A. 1974, University of Colorado

Fenton, Wayne — Md.
B.A. 1975, Bard College

Ferguson, Katherine — Wash.
B.A. 1968, Sarah Lawrence College
B.S. 1972, University of Washington

Ferraraccio, Blaise — Md.
B.S. 1975, George Washington University

Feuillan, Penelope — D.C.
B.A. 1962, Radcliffe College

Flagg, Stephanie — N.Y.
B.S. 1975, George Washington University

Freudman, Jonathan — N.Y.
B.S. 1975, George Washington University

Funt, David — N.Y.
B.S. 1975, Cornell University

Futterman, Bennett — N.Y.
B.A. 1975, Rutgers University

Garlick, William — N.C.
B.A. 1971, Brown University

Gilbert, Kenneth — Wash.
B.S. 1975, University of Washington

Gillette, Warren — Ark.
B.A. 1968, University of Arkansas

Gittler, Mark — Calif.
B.A. 1974, Brown University

Gittleson, Joanne — Md.
B.A. 1974, Tufts University

Gleazer, Susan — Calif.
B.A. 1972, California State University, San Francisco

Goldfarb, Mark — N.Y.
B.S. 1975, University of Michigan

Goldman, Sherry — Md.
B.A. 1974, University of Miami

Greenbaum, Marvin — Pa.
B.A. 1972, Johns Hopkins University

Greene, Vybert — D.C.
B.S. 1970, Howard University

Gutzmore, Jennifer — Mass.
B.A. 1975, Brandeis University

Hamilton, James — Conn.
B.A. 1975, University of Connecticut

Hansen, Robert — Utah
B.A. 1973, University of Utah

Hansen, Susan — Calif.
B.A. 1974, University of California

Hara, Christine — Hawaii
B.A. 1974, University of Hawaii

Haskins, Jeffrey — Md.
B.S. 1975, Howard University

Heisler, Michael — Pa.
B.A 1971, University of Notre Dame

Heyncker, Theodore — D.C.
B.S. 1973, Georgetown University

Hicks, Charles — Ill.
B.S. 1970, U.S. Naval Academy

Hill, Michael — D.C.
B.A. 1975, Williams College

Hobbs, Brad — Utah
B.S. 1975, Brigham Young University

Hockenberry, Ann — Wis.
B.A. 1974, Earlham College

Hogan, William — Fla.
B.S. 1976, Emory University

Holderness, Gayle — Calif.
B.S. 1971, M.S. 1974, University of California, Los Angeles

Holeman, Gwendolyn — Ga.
B.A. 1970, Howard University

Holman, Phillip — Utah
B.S. 1974, Brigham Young University

Hutton, Nancy — N.J.
B.S. 1975, Muhlenberg College

Jaffurs, William — Md.
B.S. 1974, Duke University

Jenson, Hal — Utah
B.S. 1975, Brigham University

Kaminsky, Donald — Vt.
B.A. 1974, University of Vermont

Kayhoe, Donald — Md.
B.S. 1975, Georgetown University

Kennedy, Colleen — N.Y.
B.A. 1972, Swarthmore College

Kirby, Donald — Ill.
B.S. 1975, George Washington University

Kishel, Joan — Pa.
B.S.N. 1971, University of Pennsylvania

Kleiman, Samuel — N.Y.
B.S. 1974, George Washington University

Kohler, Peter — N.J.
B.A. 1975, University of Maine

Kosty, Michael — Calif.
B.S. 1972, M.A 1975, University of California, Berkeley

Kravitz, Larry — Fla.
B.S. 1975, University of Florida

Landsberger, Ellen — N.Y.
B.A. 1973, M.S. 1976, Tufts University

Larson, Steven — Wash.
B.A. 1974, University of Washington

Lednar, Wayne — N.C.
B.S. 1971, M.S. 1973, Ph.D. 1975, University of North Carolina

Lemm, Gordon — Calif.
B.A. 1974, University of California, Los Angeles

Lerch, Robert — N.J.
B.A. 1974, Ohio Wesleyan University
M.A. 1975, Boston University

Levenson, Candice — Calif.
B.A. 1971, University of California, Los Angeles

Libby, Russell — Md.
B.S. 1974, George Washington University

Ludgin, J. Richard — Conn.
B.A. 1971, New York University

Manfre, Kenneth — N.Y.
B.A. 1967, City University of New York, Queens College

Marzolf, Robert James — Miss.
B.A. 1972, M.S. 1974, University of Missouri

McCowin, Joseph — Calif.
B.A. 1975, University of California, Berkeley

McKeown, Janice — Ala.
B.A. 1973, Mills College
M.S. 1975, University of California

McVey, Kevin — Wash.
B.A. 1975, Eastern Washington State College

Midthun, Karen — Md.
B.S. 1975, Massachusetts Institute of Technology

Moret, Mark — N.D.
B.S. 1975, University of North Dakota

Munoz, Jesse — N.Y.
B.A. 1974, Princeton University

Myerson, Ross — Vt.
B.A. 1972, Washington University

NaPier, Bradford — Calif.
B.A. 1975, University of the Pacific

Nichols, Glenn — Pa.
B.A. 1974, Gettysburg College

Parker, John — Va.
B.A. 1973, Williams College

Parkinson, Michael — Conn.
B.A. 1975, Cornell University

Parrott, Maureen — Md
B.S. 1975, George Washington University

Perman, Kevin — N.Y.
B.S. 1973, City University of New York, Brooklyn College

Quint, Andrew — N.Y.
B.A. 1974, Oberlin College

Reif, Henry — Mass.
B.A. 1975, Amherst College

Reiley, Mark — Calif.
B.A. 1972, M.A. 1975, Claremont Men's College

Reznick, Steven — D.C.
B.S. 1975, University of Maryland

Roberts, William — D.C.
B.A. 1975, Princeton University

Rodriguez, Eric — Md.
M.H. 1973, Yale University
B.A. 1975, George Washington University

Roesler, Paul — Colo.
B.A. 1974, M.A. 1975, Stanford University

Rose, David — Calif.
B.A. 1975, University of California

Rothenberg, Peter — N.Y.
B.A. 1973, M.A. 1975, Colgate University

Rubin, Joshua — Pa.
B.A. 1974, University of Virginia

Schaus, James — N.Y.
B.S. 1975, State University of New York at Stony Brook

Schoultz, Nils — Conn.
B.A. 1968, University of California, Santa Cruz; M.S.W. 1972, Smith College

Sciabbarrasi, Joseph — Md.
B.S. 1972, Georgetown University
M.S. 1975, George Washington University

Sege, Vivian — Md.
B.A. 1975, Brown University

Senft, Susan — Iowa
B.S. 1975, University of Dubuque

Shapiro, Gary — Mich.
B.S. 1976, Michigan State University

Siciliano, Donna — Va.
B.A. 1971, Ithaca College

Siddoway, Roger — Utah
B.A. 1974, University of Utah

Simms, Harry — N.Y.
B.A. 1975, Johns Hopkins University

Sisto, Domenick — N.J.
B.A. 1975, University of Vermont

Smith, Albert — Calif.
B.A. 1972, University of California, Berkeley

Snyder, Barbara — N.Y.
B.A. 1970, M.S. 1972, Columbia University

Spencer, Elizabeth — D.C.
B.A. 1973, Radcliffe College
M.A.T. 1974, George Washington University

Stackhouse, Charles — N.Y.
B.A. 1975, Princeton University

Stanley, Brian — Md.
B.S. 1972, University of Maryland
M.S. 1975, Massachusetts Institute of Technology

Strand, Brian — Wis
B.S. 1974, University of Wisconsin

Stretch, Gwendolyn — D.C.
B.A. 1975, Bowdoin College

Taney, Barry — N.J.
B.S. 1975, Brown University

Taylor, Crystal — D.C.
B.A. 1973, Oberlin College

Test, Eric — Calif.
B.S. 1974, Stanford University

Tolbert, Alice — D.C.
B.A. 1975, Mt. Holyoke College

Toth, William — Va.
B.A. 1971, Ohio Wesleyan University
M.S. 1973, George Washington University

Treiser, Murray — Canada
B.S. 1975, McGill University

Weiss, Steven — Calif.
B.A. 1975, University of California, Los Angeles

Westin, George — Calif.
B.S. 1969, University of Oregon

Weitstone, Jeffrey — Conn.
B.A. 1975, Wesleyan University

Wight, Steven — Calif.
B.S. 1975, Brigham Young University

Wiley, Andrew — Pa.
B.S. 1969, Cornell University
M.S. 1970, Stanford University

Williams, John — D.C.
B.A. 1970, M.S. 1973, Boston University

Winnick, David — Conn.
B.A. 1975, Union College

Winship, Joseph — Calif.
B.S. 1974, University of California, Irvine

Wiseman, Jonathan — Md.
B.A. 1973, University of Wisconsin

Witte, Madolin — Md.
B.S. 1975, American University

Zaglin, Robert — S.C.
B.A. 1975, Yale University

Zagorzycki, Maria — N.J.
B.A. 1975, Cornell University

Third Year

Allenby, Kent S. — Va.
B.A. 1973, Dartmouth College

Bandola, John — N.J.
B.A. 1971, George Washington University

Barton, Bette L. — Va.
B.A. 1958, Rutgers University
Ph.D. 1963, Columbia University

Basch, Peter — Conn.
B.A. 1974, Trinity College

Beckmann, Mary L. — Pa.
B.A. 1970, University of Rochester
M.S. 1974, University of Illinois

Blackmon, Wayne — N.Y.
B.A. 1973, New York University

Blank, Karen — Vt.
B.A. 1972, M.A. 1973, Washington University

Blue, John, Jr. — N.C.
B.A. 1973, University of North Carolina at Chapel Hill

Blumenthal, Bruce A. — N.J.
B.A. 1974, Columbia University

Bober, John F. — Md.
B.A. 1974, Johns Hopkins University

Bohon, Constance J. — Mo.
B.A. 1974, Mount Holyoke College

Borodulia, Nicholas N. — Md.
B.S. 1974, George Washington University

Brennan, Bruce — N.Y.
B.A. 1974, Columbia University

Brown, Martin H. — N.Y.
B.S. 1974, George Washington University

Bruce, Donald — Calif.
B.A. 1974, University of California, Berkeley

Butler, Maurice — D.C.
B.S. 1974, Howard University

Byers, Robert H. — N.Y.
B.S. 1973, State University of New York at Stony Brook

Campbell, Alan D. — Mich.
B.A. 1974, University of Michigan

Carson, Linda C. — Conn.
B.A. 1974, Connecticut College

Cashell, Alan — D.C.
B.A. 1970, Dickinson College

Chang, Clayton W. — Hawaii
B.A. 1974, Columbia University

Chin, Robert — D.C.
B.S. 1974, Dickinson College

Chopivsky, Peter — Ill.
B.A. 1974, Princeton University

Cohen, John B. — Va.
B.A. 1972, University of Pennsylvania

Cotter, James C. — Calif.
B.S. 1974, University of California, Los Angeles

Daniels, Marcia — Calif.
B.S. 1973, Trinity College

Davidson, Richard S. — Utah
B.S. 1974, Weber State College

Demberg, James H. — N.Y.
B.A. 1973, New York University

Dent, Dean A. — Md.
B.A. 1974, Brown University

Dietz, Abraham — Mass.
B.A. 1972, Amherst College

Doppelheur, John D. — Ga.
B.A. 1974, George Washington University

Dunbar, Lala — Va.
B.S. 1954, Ph.D. 1972, George Washington University

Edelglass, John W. — Conn.
B.S. 1973, M.S. 1974, Tufts University

Ein, Thomas E. — N.J.
B.S. 1972, George Washington University
M.S. 1974, Georgetown University

Engstrom, Fayette — Ohio
B.A. 1968, University of Pennsylvania

Epstein, Paul M. — N.Y.
B.S. 1973, City University of New York, Brooklyn College

Evans, Geoffrey — Va.
B.A. 1973, University of Richmond

Feldman, Dennis H. — N.J.
B.A. 1974, Colgate University

Feller, Bruce S. — N.J.
B.A. 1974, University of Rochester

Filak, Andrew T. — N.J.
B.A. 1974, St. Peter's College

Frank, Dana H. — N.Y.
B.A. 1973, Brown University

Freer, Carol — Va.
B.S. 1968, University of Delaware

Frenkel, David S — Conn.
B.A. 1973, Washington University

Frey, Linda R. — Wis.
B.A. 1969, Smith College
M.A. 1971, University of Wisconsin

Freidman, Roger J. — Md.
B.A. 1973, Washington University

Fritz, Alan — Calif.
B.S. 1972, University of California, Berkeley

Fuchs, Thomas D. — Md.
B.A. 1974, Duke University

Furlow, Jerilin — Md.
B.A. 1969, George Washington University

Galante, Ardele — N.Y.
B.S. 1973, Tufts University

Geier, Mark R. — Md.
B.S. 1970, Ph.D. 1973, George Washington University

Gianfortoni, Joseph G. — Pa.
B.A. 1973, Franklin and Marshall College

Goade, Gracia M. — D.C.
B.A. 1970, University of Pennsylvania
M.S. 1972, Johns Hopkins University

Goodman, Amy S. — N.J.
B.A. 1971, New York University

Goumas, William M. — Va.
B.A. 1973, Emory University

Hoeck, Barbara E. — Md.
B.S. 1974, George Washington University

Hogan, Mary P. — Md.
B.A. 1974, George Washington University

Holzman, Robert S. — N.Y.
B.S. 1971, City University of New York

Horn, Carole E. — Fla.
B.A. 1966, Brandeis University
M.A. 1969, Columbia University

Horn, Janet — Md.
B.A. 1972, Vanderbilt University
M.S. 1973, Georgetown University

Horwitz, Stuart L. — N.J.
B.A. 1972, Colgate University

Jacobs, Howard S. — Ohio

Jensen, Peter S. — Wash.
B.S. 1974, Brigham Young University

Kane, Elinoe — Mass.
B.A. 1958, Wheaton College

Kaplan, Alan N. — N.Y.
B.A. 1971, George Washington University
M.A. 1974, Tufts University

Kaplan, Fred M. — N.Y.
B.A. 1974, Colgate University

Kendrick, Juliette S. — Md.
B.A. 1974, Wesleyan University, Conn.

Kentro, Tenney — N.Y.
B.A. 1967, Yale University

Knight, Elizabeth A. — Md.
B.A. 1973, Mount Holyoke College

Kohanna, Fred — Vt.
B.S. 1974, Columbia University

Kotzen, Jeffrey H. — Pa.
B.S. 1974, George Washington University

Kovarick, Suzan — Pa.
B.A. 1974, University of Vermont

Kravitz, Jack — Fla.

Lanzafame, Raymond J. — N.Y.
B.S. 1974, Cornell University

Lee, John S. — Md.
B.S. 1967, Yale University
Ph.D. 1973, George Washington University

Lessin, Susan R. — Fla.
B.A. 1974, Northwestern University

Levine, Laurence — N.Y.
B.A. 1972, New York University

Lewis, Stuart A. — N.Y.
B.S. 1974, Cornell University

Liu, Mini A. — Calif.
B.A. 1971, Radcliffe College

Loggins, William F. — Ohio
B.A. 1974, Miami University

Makinen, Lynn J. — Wash.
B.S. 1974, University of Washington

Marano, Matthew J. — N.J.
B.A. 1974, Columbia University

McGowan, Judson C. — Ga.
B.S. 1969, University of Rochester

Merritt, Carolyn L. — Conn.
B.A. 1971, Howard University

Michelstein, Richard D. — N.Y.
B.A. 1974, University of Rochester

Moore, Robert C. — N.H.
B.S. 1969, Trinity College
M.S. 1973, University of Minnesota

Morris, Howard G. — Md.
B.A. 1974, Wake Forest College

Moshman, Gordon S. — Colo.
B.A. 1974, University of Colorado

Mudrock, John D. — N.J.
B.A. 1974, Rutgers University

Munves, Jon — N.Y.
B.S. 1973, State University of New York, at Albany

Murray, Kevin M. — Calif.
B.A. 1974, Stanford University

Neiman, Richard A. — N.J.
B.S. 1974, University of Michigan

Newman, Richard S. — N.Y.
B.S. 1974, Tufts University

Newman, Sandra — Va.
B.S. 1970, M.S. 1974, Massachusetts Institute of Technology

Orton, Kimball R. — Utah
B.S. 1974, Brigham Young University

Ourieff, Bruce — Calif.
B.A. 1973, Amherst College

Penenberg, Brad — N.Y.
B.A. 1973, Brooklyn College

Petrone Joseph J. — N.Y.
B.A. 1971, Cornell University

Pickard, Jeffrey — Mass.
B.A. 1974, Johns Hopkins University

Piperi, Vincent D. — N.J.
B.A. 1973, Seton Hall University

Powell, Blake L. — Md.
B.S. 1973, George Washington University

Rea, Robert F. — Md.
B.A. 1973, Vanderbilt University

Rigel, Darrell S. — Calif.
B.S. 1972, M.S. 1974, Massachusetts Institute of Technology

Rintel, Theodor D. — N.Y.
B.A. 1973, Antioch College

Rizzoli, Paul B. — Md.
B.A. 1974, Haverford College

Rogal, Gary — N.J.
B.S. 1974, George Washington University

Rogers, Clare R. — N.Y.
B.A. 1969, Barnard College

Rosenstein, Howard — N.Y.
B.A. 1972, Hamilton College

Saidman, Sander B. — D.C.
B.A. 1974, Washington University

Santos, Robert T. — Calif.
B.A. 1973, University of California, Berkeley

Sarno, Robert A. — Colo.
B.S. 1974, U.S. Air Force Academy

Savituky, S. Mitchell — N.Y.
B.A. 1973, Cornell University

Seidel, Eric C. — Pa.
B.S. 1972, Albright College
M.S. 1973, Wayne State University

Seidman, Christine — Wis.
B.S. 1974, Radcliffe College

Sheen, Michael R. — Utah
B.S. 1974, Brigham Young University

Sherman, Orrin — N.J.
B.A. 1974, University of Vermont

Shulman, Lois — N.J.
B.S. 1974, George Washington University

Shuman, Harry I. — N.Y.
B.A. 1974, University of Rochester

Silver, Lee R. Calif.
B.S. 1970, M.S. 1974, Rhode Island University

Simons, Steven M. N.Y.
B.A. 1971, M.A. 1974, Wesleyan University, Conn.

Singer, Ira J. N.J.
B.S. 1974, George Washington University

Sloan, Dean D. Va.
B.A. 1972, Duke University

Smith, Roy A. N.Y.
B.S. 1974, City University of New York, Brooklyn College

Smith, Steven B. Utah
B.S. 1974, University of Utah

Solof, Robert, Sr. N.Y.
B.S. 1970, Purdue University

Stevens, David M. Md.
B.A. 1969, Washington University
M.A. 1974, Brown University

Strauus, Steven C. Md.
B.A. 1973, Northwestern University
M.S. 1974, George Washington University

Struck, Kent D N.D.
B A 1966, Harvard University

Sunderland, Pearson Md.
B.A. 1974, Harvard University

Tanzer, Peter P. Pa.
B.S. 1974, George Washington University

Tarassoff, Peter G. Va.
B S. 1969, Ph.D. 1974, George Washington University

Taub, Steven L. N.Y.
B A. 1974, City University of New York, Queens College

Taylor, George A. Mich.
B.S. 1974, George Washington University

Tinker, Alice Va.
B.S. 1972, University of Maryland

Tonnemacher, Kent D. Calif.
B.A. 1972, University of California, Berkeley

Tossell, Julia W. Md.
B.A. 1969, Radcliffe College
M.A. 1970, Columbia University

Trenbath, Richard S. D.C.
B.A. 1965, University of North Carolina

Wahl, Richard N.Y.
B.A. 1973, University of Rochester

Waltos, David L. Conn.
B.S. 1974, Trinity College

Weed, Thomas S. Kans.
B.A. 1974, Williams College

Weilburg, Jeffrey B. N.Y.
B.S. 1974, Union College

Wells, John J. Ohio
B.S. 1974, Notre Dame University

Wemple, Donna W. Md.
B.S. 1973, University of Maryland

Wescott, Stephen Wash.
B.S. 1973, University of Washington

Wilbur, Andrew C. Ill.
B.A. 1974, Stanford University

Winnick, Sheldon Calif.
B.A. 1965, University of California, Berkeley

Wisoff, Jeffrey H. N.Y.
B.S. 1974, Union College

Wong, Albert K. N.Y.
B.A. 1974, St. John's University

Wurzell, William D. Md.
B.S. 1970, Boston College
M.A. 1972, George Washington University

Wyse, Roberta L. N.J.
B.A. 1974, Wellesley College

Ziegler, Penelope P. Md.
B.S. 1973, George Washington University

Fourth Year

Allen, Donald W. Mont.
B.A. 1972, University of Utah

Alper, Michael J. N.J.
B.A. 1973, University of Pennsylvania

Altieri, Michael F. Conn.
B A. 1973, Colgate University

Anderson, Robert E. Wash.
B S. 1971, University of Washington

Anixter, William L. Calif.
B.A. 1972, University of California, Berkeley

Artiss, Frederick L. Md.
B.A. 1973, Johns Hopkins University

Barone, Charles J.

Baxley, Robert S. Mich.

Beall, John A., Jr. Wash.
B.S. 1972, Gonzaga University

Benner, Charles M. N.D.
B.A. 1972, St. Olaf College

Bennett, Howard J. Ind.
B.S. 1973, American University

Bernstein, Robert M. N.Y.
B.S. 1972, University of Maryland

Bertolli, Susan J. N.Y.
B.S. 1973, State University of New York at Albany

Birnbaum, Stuart E. Calif.
B.A. 1970, University of California, Berkeley
M.A. 1972, Stanford University

Blatt, David E. Ga.
B.S. 1972, Emory University

Blatt, David E. Ind.
B.A. 1973, Harvard University

Bliss, Mark C. R.I.
B.S. 1973, University of Rhode Island

Blumberg, Neil H. N.J.
B.A. 1973, Emory University

Bober, Douglas Conn.

Boscia, John A. Md.
B.A. 1973, Duke University

Brenner, Myron D. Pa.
B.A. 1963, Columbia University
B.Arch. 1968, University of Pennsylvania

Brickhouse, William D. Va.
B.S. 1973, Clark College

Brinton, Milton H. Calif.

Brown, David L. Fla.
B.S. 1970, U.S. Military Academy

Cantamout, Steven E. Calif.
B.S. 1973, University of Santa Clara

Casas, Luis A. Spain
B.A. 1973, Johns Hopkins University

Chung, Kenton L. Calif.
B.A. 1973, University of California, Berkeley

Clark, Bernard A. Md.
B.S. 1973, Dickinson College

Clark, Gordon H., Jr. Conn.
B.A. 1970, Yale University
M.Div. 1973, Pacific School of Religion

Cohen, Marc D. Ill.
B.A. 1973, Dartmouth College

Cole, Martha T. N.J.
B.A. 1967, Vassar College
Cooper, William D.C.
B.S. 1966, American University
Crisp, Ronald J. Md.
B.S. 1967, Wheeling College
M.S. 1972, Georgetown University
Daniels, Toni D. N.J.
B.S. 1973, Fairleigh Dickinson University
Davis, Kathleen K. Md.
B.A. 1968, Wellesley College
DeOrio, James K. Mich.
B.S. 1970, U.S. Air Force Academy
Dodge, John H. Md.
B.A. 1973, Harvard University
Dolgin, Frederick C. Mass.
B.A 1973, Yale University
Domaleski, Robert P. N.J.
B.S. 1973, St. Peter's College
Dondero, Lynn R. Va.
B.A. 1972, B.A. 1973, University of California, Berkeley
Dudley, Martha D. D.C.
B.A. 1973, Brown University
Dynof, Francis R. N.J.
B.A. 1973, Rutgers—The State University
Eisenfeld, Larry S. Va.
B.S. 1972, Muhlenberg College
Emsellem, Helene A. Md.
Fang, Peter J. Md.
Farber, Harrison Va.
B.S. 1969, Duke University
Feingold, Gail J. N.J.
B.A. 1972, University of Pennsylvania
Feldman, Stuart N.Y.
B.S. 1973, State University of New York
FitzHarris, Joseph B. N.Y.
B.S. 1973, U.S. Military Academy
Frisby, Shayla A. Va.
B.A. 1966, Trinity College, D.C.
Fuchs, Daniel G. Md.
B.A. 1973, Dartmouth College
Garfinkle, Terry J. N.Y.
B.A. 1973, University of Pennsylvania
Glaza, Eve E. Utah
B.F.A. 1970, University of Utah
Glikin, Sanford E. Va.
B.S. 1973, George Washington University
Gorham, Jay R. Wash.
B.S. 1973, Washington State University
Gorman, Joel R. D.C.
B.A. 1973, Wesleyan University
Gorovoy, Mark S. N.J.
B.A. 1973, Duke University
Gossom, John Md.
B.A. 1972, Occidental College
Greene, Robert D. N.Y.
B.A. 1972, George Washington University
Hales, Robert E. Ill.
B.S. 1970, U.S. Military Academy
Hanowell, Leland H. Calif.
B.S. 1973, University of California, Davis
Harhay, Joseph S. N.Y.
B.A. 1972, Syracuse University
Harrison, Johnny Ruth Calif.
B.S. 1973, George Washington University
Hawkins, Matthew T., Jr. Pa.
B.S. 1971, University of Pennsylvania
Heinecke, Susan Kern Ill.
Hillsman, Regina O. N.Y.
B.A. 1972, Bryn Mawr College
Hochman, Bruce N. Calif.
B.A. 1972, University of California, Berkeley
Holl, Thomas M. Ohio
B.S. 1973, George Washington University
Hom, Kenrick E. N.Y.
B.S. 1973, Tufts University
Hopkins, William P. Wis.
B.S. 1973, University of Minnesota
Horn, Martin S. N.H.
B.A. 1973, University of New Hampshire
Hotez, Lawrence S. Conn.
B.S. 1973, Trinity College, Conn.
Imershein, Ruth E. N.Y.
B.A. 1972, Washington University
Isaacson, Dale H. Md
Jacobson, Jeff N.J.
B.A. 1973, University of Rochester
Kampmeier, Patricia A. Ill.
B.A. 1973, Northwestern University
Kanter, Mitchel A. Md.
B.S. 1973, Duke University
Kehne, Susan M. Md.
B.S. 1973, Mount Holyoke College
Keller, Marc S. N.Y.
B.A. 1973, Hamilton College
Knutson, Anne N.J.
B.A. 1973, University of Vermont
Kolzak, Nancy E. Va.
B.S. 1973, Smith College
Krembs, Gerhard A. II N.Y.
B.A. 1972, Eisenhower College
Kubik, Carolyn J. Ill.
B.A. 1973, University of Kansas
Kung, George Y. Wash.
B.S. in E.E. 1973, University of Washington
Kushner, Mark J. Md.
B.A. 1973, Johns Hopkins University
Lagin, Sheri J. N.Y.
B.A. 1973, George Washington University
Laigon, Eugene E., Jr. Pa.
B.S. 1973, Muhlenberg College
Lamensdorf, Michael D.C.
B.A. 1973, Oberlin College
Lederer, Helen A. N.Y.
B.S. 1972, George Washington University
Lewis, Norman N.Y.
B.A. 1973, Vassar College
Libby, Louis S. Conn.
B.S. 1972, Tufts University
Liebermann, Joan V. N.Y.
B.A. 1973, University of Wisconsin—Madison
Lustig, Ilana D. N.Y.
B.S. 1973, Fairleigh Dickinson University
Maunder, Richard J. Calif.
B.A. 1972, University of California, Berkeley
Metelits, Joel B. Conn.
Model, Lawrence M. N.J.
B.A. 1973, Rutgers—The State University
Mosby, John A. N.Y.
B.A. 1973, City University of New York, Hunter College
Neill, Marguerite A. N.J.
B.A. 1973, Bryn Mawr College
Nenonen, Rita S. N.Y.
B.A. 1968, Vassar College
M.S.W. 1970, University of Pennsylvania
Nielsen, Peter C. Calif.
B.S. 1973, Brigham Young University
Orak, John K. N.J.
B.S. 1973, St. Peter's College
Orvin, Donna C. Md.
B.A. 1969, Ed.M. 1971, Duke University
Parker, Paul M. N.J.
B.S. 1973, Union College, N.Y.

Paul, Michael L. Pa.
B.A. 1973, Temple University
Pavluk, Charles H. Ohio
B.G.S. 1973, University of Kentucky
Peck, Dawn Pa.
Peck, Thomas S. Ill.
B.S. 1972, Indiana University at Bloomington
Puro, David M. N.Y.
B.A. 1973, New York University
Rabkin, Anne E. Md.
B.A. 1973, Smith College
Rallis, Michael G. Va.
Rhymers, Kurt L. Minn.
B.S. 1966, U.S. Military Academy
M.S. 1971, Stanford University
Roat, James W. D.C.
B.S. 1973, Pennsylvania State University
Rollins, Charles J. Md.
B.S. 1972, George Washington University
Rose, Howard A. Mass.
B.A. 1973, Harvard University
Rosenberg, Gary J. N.Y.
B.S. 1973, George Washington University
Rosenfield, Louis D. Conn.
Rusin, Grant M. N.J.
B.S. 1973, Fordham University
Ruttenberg, Rhoda Md.
B.A. 1961, Syracuse University
Saslow, Eric D. N.Y.
B.A. 1973, Cornell University
Schiffner, Craig A. N.J.
B.A. 1973, Princeton University
Schliftman, Alan B. N.Y.
B.A. 1973, University of Rhode Island
Schneider, Marta A. D.C.
B.A. 1973, Trinity College, D.C.
Schulman, Jeffrey M. Va.
B.A. 1973, George Washington University
Seibert, Donald G. N.Y.
B.S. 1973, Bucknell University
Shirley, Eric A. Mass.
B.A. 1973, Cornell University
Shumaker, Douglas R. Pa.
B.S. 1973, Pennsylvania State University
Siegel, Robert S. Pa.
B.A. 1973, Stanford University
Smith, Arthur R. III N.J.
B.A. 1973, Dartmouth College
Smith, Laurence R. Utah
Sokoloff, Daniel O. Fla.
B.A. 1972, Tulane University
Stansfield, Stephen J. Wash.
B.S. 1973, Washington State University
Stetz, Christian W. Mass.
B.S. 1971, Massachusetts Institute of Technology
Stine, Walter S. Ohio
B.S. 1973, U.S. Air Force Academy
Stoddard, Ronald A. Utah
B.S. 1973, Brigham Young University
Thompson, Joanne Calif.
B.S. 1973, University of California, Los Angeles
Trice, James N.Y.
B.S. 1972, City University of New York, Richmond College
Tway, Kenneth P. Calif.
B.S. 1973, Stanford University
Uretsky, Stephen H. N.J.
B.S. 1973, University of Maryland
Van Nice, Robert B. Wash.
B.S. 1970, Montana State University
Vickers, Curtis W. N.Y.
B.A. 1973, University of Bridgeport
Wedberg, Robin C. Calif.
B.A. 1972, Stanford University
Weitz, Susan R. N.Y.
B.S. 1973, Cornell University
Wertheimer, Debra S. Md.
B.A. 1973, Goucher College
Widlitz, Michael D. N.Y.
B.G.S. 1973, University of Michigan
Willis, James A. Calif.
B.A. 1966, M.A. 1968, University of California, Berkeley
Winchenbach, Curtis L. Maine
B.A. 1972, Northeastern University
Winston, Jonathan A. N.Y.
B.S. 1973, Muhlenberg College
Wright, Curtis IV Pa.
B.S. 1971, Haverford College
Yago, Kate Md.
B.S. 1972, George Washington University
Zielinski, Christopher J. N.Y.
B.S. 1973, University of Notre Dame

Summaries of Registration, M.D. Program

Number of Registrants

Class entering 1976	152	Class entering 1974	15
Class entering 1975	152	Class entering 1973	15

Geographical Distribution of Medical Students

Alabama	1	New Hampshire	
Arizona	1	New Jersey	
Arkansas	1	New Mexico	
California	67	New York	11
Colorado	4	North Carolina	
Connecticut	24	North Dakota	1
District of Columbia	37	Ohio	
Florida	8	Oregon	
Georgia	6	Pennsylvania	
Hawaii	2	Rhode Island	
Illinois	11	South Carolina	
Indiana	4	Tennessee	1
Iowa	1	Utah	
Kansas	2	Vermont	
Louisiana	2	Virginia	
Maine	3	Washington	1
Maryland	95	Wisconsin	
Massachusetts	19	Canada	
Michigan	12	Sierra Leone	
Minnesota	3	Spain	
Mississippi	1	Puerto Rico	
Missouri	3	Venezuela	
Montana	1		

Institutions in Which Medical Students Earned Degrees

Albion College	1	California State University:	
Albright College	1	San Francisco	
Allegheny College	1	San Jose	
American University	4	California, University of:	
Amherst College	4	Berkeley	
Antioch College	10	Davis	
Arizona, University of	1	Irvine	
Arkansas, University of	1	Los Angeles	
Babson College	1	Santa Barbara	
Bard College	1	Santa Cruz	
Barnard College	1	Case Western Reserve University	
Boston University	4	Catholic University of America	
Bowdoin College	2	Claremont Men's College	
Brandeis University	3	Clark College	
Bridgeport, University of	1	Clark University	
Brigham Young University	11	Colby College	
Brown University	8	Colgate University	
Bryn Mawr College	2	Colorado, University of	
Bucknell University	1	Colorado State University	
		Columbia University	

Connecticut College	3
Connecticut, University of	2
Cornell University	15
Dartmouth College	6
Dayton, University of	1
Delaware, University of	1
Dickinson College	3
Dubuque, University of	1
Duke University	11
Earlham College	1
Eastern Washington State College	1
Eisenhower College	1
Emory University	6
Fairleigh Dickinson University, Rutherford	1
Fairleigh Dickinson University, Teaneck	1
Florida, University of	1
Fordham University	2
Franklin and Marshall College	1
George Washington University	69
Georgetown University	7
Gettysburg College	1
Gonzaga College	1
Goucher College	1
Hamilton College	4
Harvard University	7
Haverford College	2
Hawaii, University of	1
Hobart and William Smith Colleges	10
Holy Cross, College of the	1
Howard University	13
Illinois, University of	3
Indiana University at Bloomington	3
Ithaca College	2
John Hopkins University	12
Kalamazoo College	1
Kansas, University of	2
Kent State	1
Kentucky, University of	1
Kenyon College	1
Knox College	1
Lake Forest College	1
Lewis and Clark College	1
London, University of	1
Loyola College	1
Macalester College	2
Maine, University of	3
Marquette University	3
Maryland, University of	12
Massachusetts Institute of Technology	7
Massachusetts, University of	1
Miami University	2
Miami, University of	2
Michigan, University of	7
Michigan State University	1
Mills College	1
Minnesota, University of	3
Missouri, University of—Columbia	1
Montana State University	1
Mount Holyoke College	4
Mount Union College	1
Muhlenberg College	5
New Hampshire, University of	2
New York, City University of:	
Brooklyn College	4
City College	1
Hunter College	1
Queens College	3
Richmond College	1
New York, State University of:	
at Albany	2
at Binghamton	1
at Stony Brook	4
New York University	9
North Carolina, University of	4
North Dakota, University of	1
Northeastern University	1
Northern Arizona University	1
Northwestern University	5
Notre Dame, University of	3
Oberlin College	3
Occidental College	1
Ohio Wesleyan University	1
Oklahoma State University	1
Oregon, University of	1
Pacific School of Religion	1
Pacific, University of the	1
Pennsylvania State University	3
Pennsylvania, University of	10
Pittsburgh, University of	2
Princeton University	10
Purdue University	1
Radcliffe College	6
Rhode Island, University of	3
Richmond, University of	1
Rochester, University of	10
Rutgers—The State University	8
St. John's College	2
St. John's University	2
St. Lawrence University	1
St. Olaf College	1
St. Peter's College	3
Santa Clara, University of	1
Sarah Lawrence College	1
Seton Hall University	1
Skidmore College	1
Smith College	4
Stanford University	18
Swarthmore College	3
Syracuse University	3
Temple University	1

Texas, University of, at Austin	1	Virginia, University of	1
Toronto, University of	1	Wake Forest University	1
Trinity College, California	1	Washington and Lee University	1
Trinity College, Connecticut	4	Washington State University	1
Trinity College, District of Columbia	3	Washington University	3
Tufts University	13	Washington, University of	7
Tulane University	2	Wayne State University	3
Union College, New York	4	Weber State College	8
Ursinus College	1	Wellesley College	1
U.S. Air Force Academy	3	Wesleyan University	4
U.S. Military Academy	7	Westminster College	4
U.S. Naval Academy	3	Wheaton College, Massachusetts	5
Utah, University of	8	Wheeling College	1
Valparaiso University	1	William and Mary, College of	4
Vassar College	4	Williams College	4
Vanderbilt University	4	Wisconsin, University of	12
Vermont, University of	5	Yale University	4
		Yeshiva University	5

Number of college graduates ..... 588 Number of institutions represented 170

Recipients of the Degree of Doctor of Medicine, 1976

Name, State of Residence, Degree Held	Internship and Residency Appointments
James Baisley, Virginia B.S. 1964, Pennsylvania State University Ph.D. 1969, Indiana University at Bloomington	Children's Hospital, Washington, D.C.
Peter Barnett, Connecticut B.A. 1972, Wesleyan University	Yale—New Haven Hospital New Haven, Conn.
Daryl Beabeau, Arizona B.S. 1969, George Washington University	Sepulveda Veterans Administration Hospital Sepulveda, Cal.
Norman Bos, Kansas B.A. 1972, University of Kansas	Wright-Patterson Air Force Base Medical Center, Ohio
William Brancaccio, New York B.A. 1972, Villanova University	State University—Kings County Hospital Center, Brooklyn, N.Y.
Robert Brauner, Pennsylvania B.S. 1971, Cornell University	Womens & Infants Hospital Providence, R.I.
Joseph Braverman, New York B.S. 1970, City University of New York, City College	State University—Kings County Hospital Center, Brooklyn, N.Y.
Alan Brenner, Washington B.A. 1972, University of Washington	University of Utah Affiliated Hospitals Salt Lake City, Ut.
Richard Briggs, Utah B.S. 1972, University of Wyoming	Keesler Air Force Base Medical Center Biloxi, Miss.
Richard Brown, Pennsylvania B.S. 1970, Lehigh University	Medical Center Hospital of Vermont Burlington, Vt.
Nancy Bruckner, New Jersey B.A. 1972, University of Pennsylvania	Washington Hospital Center Washington, D.C.
Robert Burk, Maryland	University of California Hospitals San Francisco, Cal.
Steven Burka, Maryland B.S. 1972, Bradley University	Stamford Hospital Stamford, Conn.
James Calvert, Massachusetts B.A. 1967, Harvard University	St. Mary's Hospital Center Madison, Wis.

Name, State of Residence, Degree Held	Internship and Residency Appointments
Robert Castle, Virginia B.A. 1969, College of Wooster	George Washington University Hospital Washington, D.C.
Clara Chan, Hong Kong B.S. 1972, Mary Manse College	University of Miami Affiliated Hospitals Miami, Fla
Paul Chandeysson, Virginia B.S. in E.E., B.S. in M.E. 1958, Washington University M.S. in M.E. 1962, Stanford University	Washington Hospital Center Washington, D.C.
Bruce Cooper, New Jersey B.S. 1972, Bucknell University	Washington Hospital Center Washington, D.C.
Carolyn Crump B.S. 1972, Bennett College, N.C.	St. Vincent's Hospital New York, N.Y.
Peter Cunningham, New York B.S. 1972, Union College, N.Y.	The New York Hospital New York, N.Y.
Richard Danziger, Maryland B.A. 1963, Dartmouth College Ph.D. 1968, University of Alberta	Navy Regional Medical Center San Diego, Cal.
Paul Dedick, New Jersey B.A. 1971, Catholic University of America	Los Angeles County—University of Southern California Medical Center, Los Angeles, Cal.
Christopher DePoix, Virginia B.A. 1972, Princeton University	National Naval Medical Center Bethesda, Md.
Kathy Doner, Michigan B.S. 1970, Stetson University M.P.H. 1972, University of Michigan	George Washington University Hospital Washington, D.C.
Sanford Dorman Connecticut B.A. 1972, Hobart and William Smith Colleges	Medical Center Hospital of Vermont Burlington, Vt.
John Doyle, Maryland B.S. 1972, U.S. Air Force Academy	Wilford Hall Hospital San Antonio, Tex.
Steven Duras, Washington B.S. 1972, University of Washington	Baptist Hospital Nashville, Tenn.
Martin Earle, Ohio B.S. 1972, Carnegie-Mellon University	Syracuse Medical Center Syracuse, N.Y.
Susan Elliott, Maryland B.S. 1970, Bucknell University M.S. 1972, George Washington University	University of Oregon Medical Center Portland, Ore.
Timothy Emhoff, Connecticut B.S. 1972, U.S. Air Force Academy	Wilford Hall Hospital San Antonio, Tex.
William Enos, Virginia B.S. 1972, Dartmouth College	Mayo Graduate School of Medicine Rochester, Minn.
John Fernandez-Miranda, Virginia B.S. 1968, Memphis State University B.M.S. 1974, Dartmouth College	George Washington University Hospital Washington, D.C.
Jerome Finkelstein, New York B.A. 1972, New York University	Mount Sinai Hospital New York, N.Y.
Daniel Fisher, Washington, D.C. B.A. 1965, Princeton University Ph.D. 1969, University of Wisconsin—Madison	Cambridge Hospital Cambridge, Mass.
Steven E. Fochios, New York B.A. 1972, City University of New York, City College	Lenox Hill Hospital New York, N.Y.
Thomas Francis, Alabama	Georgia Baptist Hospital Atlanta, Ga.
Richard Friefeld, New York B.A. 1970, Hofstra University	Long Island Jewish Hospital New Hyde Park, N.Y.
Edward J. Galbavy, New York B.S. 1971, Georgetown University	(postponed internship)

Name, State of Residence, Degree Held	Internship and Residency Appointments
Charles Gandy, New Mexico B.S. 1970, U.S. Military Academy	Walter Reed Army Medical Center Silver Spring, Md.
Carmen Gannon, Maryland B.S. in Nursing 1957, Loyola College M.S. 1959, University of Maryland	Medical University of South Carolina Hospitals Charleston, S.C.
Richard Gardner, California B.S. 1970, University of San Diego	University of Alabama at Tuscaloosa Medical Center, Tuscaloosa, Ala.
Marjorie Gold, Washington, D.C. B.S. 1969, Cornell College	Children's Hospital Washington, D.C.
Gary Goldstein, New York B.S. 1972, George Washington University	Los Angeles County—University of Southern California Medical Center, Los Angeles, Cal.
Stafford Goldstein, New York B.A. 1972, University of Pennsylvania	George Washington University Hospital Washington, D.C.
Brent Gooch, Idaho B.S. 1972, Utah State University	North Carolina Memorial Hospital Chapel Hill, N.C.
Leon Green, North Dakota B.A. 1971, University of Kansas B.Med.Sci 1974, University of South Dakota	Charles S. Wilson Memorial Hospital Johnson City, N.Y.
Lee Greenwood, Utah B.A. 1972, University of Utah	Wilford Hall Hospital San Antonio, Tex.
Ellen Gurian, New York B.A. 1972, New York University	Los Angeles County—University of Southern California Medical Center, Los Angeles, Cal.
Juliana Hall, Washington, D.C. B.S. in Med.Tech. 1965, George Washington University	Northwestern University Medical Center Chicago, Ill.
Kathleen Hamilton, Pennsylvania	Children's Hospital Washington, D.C.
Albert Hartman, Utah	St. Joseph's Hospital—Phoenix Phoenix, Ariz.
Michael Healy, Utah B.S. 1972, Weber State College	St. Joseph's Hospital—Phoenix Phoenix, Ariz.
Christopher Hermann, Connecticut B.S. 1972, Villanova University	George Washington University Hospital Washington, D.C.
Hector Hidalgo, Virginia	George Washington University Hospital Washington, D.C.
Scott Hillmann, New Jersey B.A. 1972, University of Delaware	Rhode Island Hospital Providence, R.I.
Joel Hirschberg, New Jersey B.A. 1972, George Washington University	Health Center Hospitals of the University of Pittsburgh, Pittsburgh, Pa.
Rick Holt, Utah B.S. 1972, Utah State University	National Naval Medical Center Bethesda, Md.
Babette Horn, New York B.A. 1972, Barnard College	Children's Memorial Hospital Chicago, Ill.
Stephen Horwitz, Maryland B.A. 1972, George Washington University	George Washington University Hospital Washington, D.C.
Antoinette Hubenette, California B.A. 1968, University of California, Berkeley B.S. 1970, George Washington University	Cedars-Sinai Medical Center—Los Angeles Los Angeles, Cal.
Richard Huey, California B.S. 1971, University of California, Berkeley	Maricopa County General Hospital Phoenix, Ariz.
Douglas Hyldahl, Idaho B.S. 1972, University of Utah	Good Samaritan Hospital Phoenix, Ariz.
Margery Johnson, Massachusetts B.A. 1972, Smith College	Tufts University Affiliated Hospitals Boston, Mass.
Noble Jones, Washington, D.C. B.A. 1970, Swarthmore College	Temple University Hospitals Philadelphia, Pa.
Lowell Kabnick, New York B.A. 1972, George Washington University	New York University—University Medical Center, New York, N.Y.

Name, State of Residence, Degree Held	Internship and Residency Appointments
Floyd Katske, New York B.A. 1972, Rutgers—The State University	George Washington University Hospital Washington, D.C.
Douglass Kay, Maryland B.S. in M.E. 1969, Purdue University	Veterans Administration Hospital Washington, D.C.
Thomas Keahey, Florida B.A. 1972, George Washington University	Ochsner Foundation Hospital New Orleans, La.
Andrew Keenan, Maryland B.S. 1972, Tulane University	Washington Hospital Center Washington, D.C.
Martha Kendall, Vermont B.A. 1969, Wellesley College	George Washington University Hospital Washington, D.C.
Mark Kinziger, Michigan B.A. 1972, Kalamazoo College	Milwaukee County Hospital Milwaukee, Wis.
Jeffrey Kiviat, New York B.S. 1972, Cornell University	Los Angeles County—University of Southern California Medical Center, Los Angeles, Cal.
Michael Klein, Maryland B.A. 1972, Washington and Jefferson College	Health Center Hospitals of the University of Pittsburgh, Pittsburgh, Pa.
Eric Knutson, New Jersey	Washington Hospital Center Washington, D.C.
Bruce Kohrn, Maryland B.A. 1972, Western Maryland College	St. Mary's Hospital Waterbury, Conn.
Walter Kope, Connecticut B.S. 1972, University of Hartford	Middlesex Memorial Hospital Middletown, Conn.
Michael Kornreich, New York B.A. 1971, George Washington University	Boston City Hospital Boston, Mass.
Banio Koroma, Sierra Leone B.S. 1972, Mount Union College	Cincinnati General Hospital Cincinnati, Ohio
Karen Kovacs, Connecticut B.S. 1972, Bucknell University	Yale-New Haven Hospital New Haven, Conn.
Mark Kozar, California B.S. 1971, M.S. 1972, University of California, Irvine	Stanford University Hospital Stanford, Cal.
Philip Leo, New York B.S. 1972, Bucknell University	York Hospital York, Pa.
Andrea Leonard, Maryland B.S. 1970, University of Michigan	George Washington University Hospital Washington, D.C.
Wayne Levin, Connecticut	Mount Sinai Hospital Miami Beach, Fla.
Roberta Locko, New York B.A. 1972, Manhattanville College	Staten Island Hospital Staten Island, N.Y.
James Longmore, Maryland B.S. 1972, University of Maryland	Wilmington Medical Center Wilmington, Del.
Michael Madden, New York B.A. 1971, College of the Holy Cross	The New York Hospital New York, N.Y.
Bard Madsen, California B.S. 1972, Brigham Young University	University of Missouri Medical Center Columbia, Mo.
Stephen Maher, Washington B.S. 1970, University of Notre Dame	Miriam Hospital Providence, R.I.
Randall Mason, Maryland B.A. 1972, Northwestern University	Tucson Hospital Tucson, Ariz.
Marcia McCowin, California B.A. 1972, University of California, Berkeley	Latter Day Saints Hospital Salt Lake City, Utah
James McLoone, Arizona B.A. 1972, University of Arizona	Los Angeles Medical Center Veterans Administration, Los Angeles, Cal.
Andrew Merliss, New Jersey B.A. 1972, Colgate University	George Washington University Hospital Washington, D.C.

Name, State of Residence, Degree Held	Internship and Residency Appointments
Marilyn Mets, Rhode Island B.A. 1969, Wheaton College, Mass.; M.S. 1972, Harvard University	Cleveland Clinic Hospital Cleveland, Ohio
Ray Morris, Ohio B.S. 1972, University of Akron	Akron General Hospital Akron, Ohio
James Murphy, Washington, D.C. B.A. 1972, Yale University	National Naval Medical Center Bethesda, Md.
Barry Nathanson, New York B.S. 1972, State University of New York at Albany	St. Mary's Hospital Waterbury, Conn.
Jay Nemiro, Pennsylvania B.A. 1972, Temple University	George Washington University Hospital Washington, D.C.
Patricia Nevius, Washington, D.C. B.A. 1971, Hiram College	Children's Hospital Washington, D.C.
Lynne Niechniedowicz, New York B.S. 1972, St. John's University, N.Y.	North Shore University Hospital Manhasset, N.Y.
Gregory Oliver, New Jersey B.A. 1972, Colgate University	George Washington University Hospital Washington, D.C.
Geoffrey Orme, Utah B.A. 1972, University of Utah	University of Oklahoma Hospitals Oklahoma City, Okla.
Robert Ostroff, Virginia	Yale-New Haven Hospital New Haven, Conn.
Morakinyo Oyewoke, Nigeria B.S 1971, Federal City College	Providence Hospital Washington, D.C.
David Pagnanelli, Pennsylvania B.A. 1972, Temple University	Abington Memorial Hospital Abington, Pa.
Dennis Parkinson, Maryland B.A 1970, University of California, Berkeley	Good Samaritan Hospital Phoenix, Ariz.
Ronald Paul, Maryland BA. 1971, Temple University	Washington Hospital Center Washington, D.C.
Russell Pearl, Connecticut B.A. 1972, University of Connecticut	University of Illinois Affiliated Hospitals Chicago, Ill.
Edward Perkins, North Dakota BA. 1968, University of Rochester M.A 1972, B.S. in Med. 1974, University of North Dakota	Andrews Air Force Base Washington, D.C.
Mark Periman, Maryland B.A. 1972, Duke University	Hospital of the University of Pennsylvania Philadelphia, Pa.
Charis Petrovich, California B.S. 1972, Stanford University	George Washington University Hospital Washington, D.C.
Louis Pollack, New York B.S. 1971, George Washington University	Children's Medical Center Seattle, Wash.
Marvin Quan, California B.S. 1972, University of California at Davis	University of California Hospital at Los Angeles, Los Angeles, Cal.
James Quigley, Maryland B.A 1971, Wesleyan University	University of Miami Affiliated Hospitals Miami, Fla.
Michael Quinn, New York B.A. 1972, Dartmouth College	Mary Imogene Bassett Hospital Cooperstown, N.Y.
Lawrence Rabkin, Maryland B.A. 1972, Yale University	University of Miami Affiliated Hospitals Miami, Fla.
Jesse Roberts, Missouri B.A. 1972, Washington University	Washington Hospital Center Washington, D.C.
Stephen Romansky, Maryland B.A. 1966, Brown University M.A. in Govt. 1972, George Washington University	Sepulveda Veterans' Administration Hospital Sepulveda, Cal.

Name, State of Residence, Degree Held	Internship and Residency Appointments
Leonard Rosen, New York B.A. 1971, George Washington University	George Washington University Hospital Washington, D.C.
Henry Roth, New York B.A 1972, Miami University	University of Colorado Affiliated Hospitals Denver, Colo.
Paul Roth, Virginia B.S. 1969, M.S. 1972, Fairleigh Dickinson University	University of New Mexico Affiliated Hospials Albuquerque, N.M.
Robert Sablove, New York B.S. 1971, State University of New York at Albany	St. Joseph's Hospital Syracuse, N.Y.
David Salter, California B.S 1972, California Polytechnic State University	San Joaquin General Hospital Stockton, Cal.
Donald Schneider, New York B.S. 1972, State University of New York at Buffalo	Children's Hospital Washington, D.C.
Marin Schulman, New Jersey B.A. 1964, New York University Ph.D. 1968, Rutgers—The State University	George Washington University Hospital Washington, D.C.
Paula Schuman, New York B.A. 1972, New York University	Baltimore City Hospitals Baltimore, Md.
Craig Seal, Utah B.S. 1972, University of Utah	University of Utah Affiliated Hospitals Salt Lake City, Utah
Gene Seligson, New York B.S. 1972, George Washington University	The New York Hospital New York, N.Y.
Steven Shapiro, Maryland B.S 1972, Yale University	The New York Hospital New York, N.Y.
Robert Sher, Maryland B.A 1972, Hiram College	Case Western Reserve Affiliated Hospitals Cleveland, Ohio
David Shupe, Utah B.A. 1972, University of Utah	Saginaw Affiliated Hospitals Saginaw, Mich.
Steven Simonsen, New York B.S. 1972, St. Lawrence University	George Washington University Hospital Washington, D.C.
David Smalley, California B.S. 1972, Brigham Young University	Ohio State University Hospitals Columbus, Ohio
Richard Smith, California	George Washington University Hospital Washington, D.C.
Jane Spiegel, Florida B.A. 1971, Duke University	University of California, Los Angeles Hospital Los Angeles, Cal.
Joseph Spinella, Connecticut B.A 1971, University of Pennsylvania	Hartford Hospital Hartford, Conn.
Carl Strawberry, Washington, D.C. B.S. 1972, St. Vincent College	Georgetown University Hospital Washington, D.C.
Paul Talboys, Maryland BA. 1972, University of Texas at Austin	Halifax District Medical Center Daytona Beach, Fla.
Mark Vangrov, Ohio B.A. 1970, Miami University	University Hospital—San Diego San Diego, Cal.
Joyce Vargyas, New Jersey B.A. 1970, George Washington University	Los Angeles County—University of Southern California Medical Center, Los Angeles, Cal.
Albert Weaver, Virginia B.S. 1970, George Washington University	Riverside Methodist Hospital Columbus, Ohio
Gregory White, Massachusetts B.A. 1972, St. Anselm's College	George Washington University Hospital Washington, D.C.
Dean Willis, Maine B.A. 1972, Assumption College	Yale-New Haven Hospital New Haven, Conn.
Frank Wolfsheimer, Washington, D.C. B.S. 1971, Purdue University	Veterans Administration Hospital Washington, D.C.

Name, State of Residence, Degree Held	Internship and Residency Appointments
Raymond Wong, New York B.S. 1972, Fordham University	William A. Shands Hospital Gainesville, Fla.
Anne Woods, Pennsylvania B.A. 1971, Catholic University of America	York Hospital York, Pa.
Bruce Yaffe, Maryland B.A. 1972, George Washington University	Mount Sinai Hospital New York, N.Y.
Neil Zolkind, New York B.S. 1972, George Washington University	Los Angeles County—University of Southern California Medical Center, Los Angeles, Cal

Recipients of Allied Health Degrees, May 1976

Associate In Science

Joe Frank Alley, Florida
Medical Services Technology
Allan Louis Amborn, Florida
Radiologic Technology
Thomas Lynn Bailey, Connecticut
Medical Services Technology
George Carl Baker, Oklahoma
Medical Services Technology
Paul Gale Barrett, Ohio
Medical Services Technology
Richard Leroy Burdess, New Jersey
Medical Services Technology
Robert Wylie Bradley, North Carolina
Medical Services Technology
Michael Lee Bryant, Maryland
Medical Laboratory Technique
James Ralph Carr, Maryland
Nuclear Medicine Technology
Derral Wayne Casper, Virginia
Medical Services Technology
David Earl Claydon, New York
Medical Services Technology
B.F.A. 1958, Ithaca College
Ronald Edwin Conklin, Tennessee
Radiologic Technology
Michael Joseph Curran, California
Medical Services Technology
Jesus Antonio Denogean, California
Medical Laboratory Technique
Michael David Dickson, Florida
Medical Services Technology
Kenneth Lee Dobbins, New Jersey
Medical Laboratory Technique
Donald Wallace Douglass, Virginia
Radiologic Technology
Don Elias Easterbrooks III, Virginia
Radiologic Technology
Wayne Stephen Ellis, California
Medical Services Technology
Terry Robert Emerson, Virginia
Medical Services Technology
Gary Noland Floyd, Texas
Radiologic Technology
Otaviano Peres Fontes, California
Medical Laboratory Technique
Elton Joseph Foret, Louisiana
Medical Services Technology
Michael Edward Gauvin, California
Medical Laboratory Technique
Anthony Lee Gilson, North Carolina
Medical Services Technology
Stephen Wayne Goggin, Florida
Medical Services Technology
William Matthew Griffith, Georgia
Medical Services Technology
Jeffrey Thomas Hardwig, Minnesota
Medical Laboratory Technique
Gregg Charles Harrington, New York
Medical Services Technology
Thomas Hasselbacher, Pennsylvania
Medical Services Technology
B.A 1969, Hobart and William Smith College
Howard Alan Heminger, Ohio
Nuclear Medicine Technology
Steven LeRoy Horst, Virginia
Radiologic Technology
John Calvin Ingram, Texas
Medical Services Technology
David Michael Jarvi, California
Radiologic Technology
Larry Arthur Kautz, Idaho
Radiologic Technology
Carl Richard Keller, Pennsylvania
Medical Services Technology
Ernest Etienne Leclerc, New York
Medical Services Technology
Gary Gale Mattlage, Maryland
Nuclear Medicine Technology
B.S. 1963, Southwestern State College
Lewis William McCloud, Ohio
Medical Services Technology
Janice Elaine McDaniel, Maryland
Medical Laboratory Technique
Steven George Milligan, Massachusetts
Medical Services Technology
Dennis Dale Mooney, Virginia
Medical Services Technology
Christopher Lee Morris, California
Medical Services Technology
Michael Andrew Parr, California
Radiologic Technology
Timothy Gary Schultz, Washington
Nuclear Medicine Technology
Michael Prescott Seaman, New York
Nuclear Medicine Technology
Robert Leonard Sims, New Jersey
Medical Services Technology
Larry Dale Stewart, California
Radiologic Technology
Robert William Trenhaile, Virginia
Medical Services Technology
Joseph William Yobe, North Carolina
Medical Services Technology

Bachelor of Science

Marilyn Ann Balicki, Michigan
Medical Technology

Thomas Howard Brown, Texas
Physician's Assistant

Antonio Jose Convit, Venezuela
Environmental Health

Rafael Jacinto Convit, Venezuela
Environmental Health

Charles Zack Henderson, District of Columbia
Environmental Health

Linda Marie Parent, District of Columbia
Environmental Health
B.A. 1970, Fordham University

Mfon Amos Ukpe, District of Columbia
Environmental Health

Emilio de Jesus Vazquez, Maryland
Medical Technology

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COLLEGES AND SCHOOLS—DEGREE PROGRAMS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES: Associate in Arts (A.A), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart. Sc.), Bachelor of Science in Geodesy (B.S. in Geod.), and Bachelor of Science in Oceanography (B.S. in Ocea.)

GRADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S), Master of Science in Special Studies (M.S. in Sp.Std.), and Doctor of Philosophy (Ph.D.)

SCHOOL OF MEDICINE AND HEALTH SCIENCES: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

NATIONAL LAW CENTER: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. (Am.Prac.)), and Doctor of Juridical Science (S.J.D.)

SCHOOL OF ENGINEERING AND APPLIED SCIENCE: Bachelor of Science (Civil Engineering) (B.S. (C.E.)), Bachelor of Science (Electrical Engineering) (B.S. (E.E.)), Bachelor of Science (Mechanical Engineering) (B.S. (M.E.)), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

SCHOOL OF EDUCATION: Bachelor of Arts in Education (B.A. in Ed.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education (M.A. in Ed.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION: Bachelor of Business Administration (B.B.A.), Bachelor of Science in Administration (B.S. in Adm.), Bachelor of Science in Health Care Administration (B.S. in H.C.A.), Master of Arts in Health Care Administration (M.A. in H.C.A.), Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.), Master of Science in Administration (M.S. in Adm.), Master of Urban and Regional Planning (M. of Urb. and Reg.Plan.), Post-Master's Graduate Certificate in Health Care Administration (Grad.Cert. in H.C.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS: Bachelor of Arts (B.A.), Master of Arts (M.A.), and Master of Science in International Affairs (M.S.I.A.)

THE GEORGE WASHINGTON UNIVERSITY

COLUMBIAN COLLEGE OF ARTS AND SCIENCES, 1821

THE GRADUATE SCHOOL OF ARTS AND SCIENCES, 1893

THE SCHOOL OF MEDICINE AND HEALTH SCIENCES, 1825

THE NATIONAL LAW CENTER, 1865

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE, 1884

THE SCHOOL OF EDUCATION, 1907

THE SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION, 1928

THE SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS, 1928

THE DIVISION OF UNIVERSITY STUDENTS, 1930

THE COLLEGE OF GENERAL STUDIES, 1950

THE SUMMER SESSIONS, 1916

THE UNIVERSITY HOSPITAL, 1898

THE DIVISION OF EXPERIMENTAL PROGRAMS, 1973

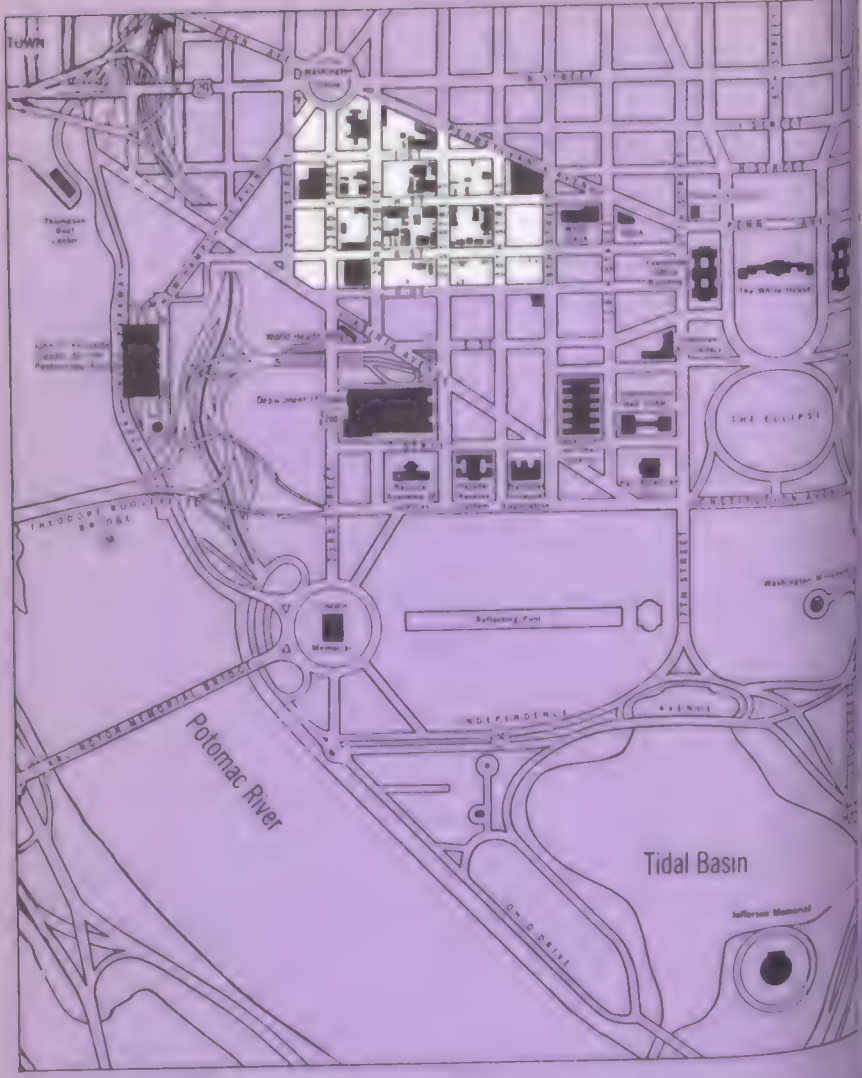
THE GEORGE WASHINGTON UNIVERSITY

August, 1977



NATIONAL LAW CENTER BULLETIN

1977–78



/ WASHINGTON, D.C.

THE GEORGE WASHINGTON UNIVERSITY
NATIONAL LAW CENTER BULLETIN
August, 1977

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1977–1978

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THE CALENDAR 1977–78*

JUNE 1977

S	M	T	W	T	F	S
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JULY 1977

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NOVEMBER 1977

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DECEMBER 1977

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FEBRUARY 1978

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MAY 1978

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1977 SUMMER TERM

May 23	Registration for all sessions (12 noon–7 p.m.) *Monday*
May 24	First-session and 13-week session classes begin *Tuesday*
May 30	Holiday *Monday*
July 1	First-session classes end *Friday*
July 4	Holiday *Monday*
†*July 5, 6, 7*	First-session examination period *Tuesday–Thursday*
July 11	Registration for students attending second-session only (2–6 p.m.) *Monday*
	Application for September 30 graduation due as part of registration
July 11	Second-session classes begin *Monday*
August 17	Last day of classes *Wednesday*
August 18, 19, 20	Second-session and 13-week session examination period *Thursday–Saturday*

* This calendar is subject to change.

† Courses in the 13-week session will meet on their regularly scheduled days during the week of July 4, excluding the holiday on Monday, July 4.

1977–78 FALL SEMESTER

August 18–19	Registration *Thursday* (12:30–7 p.m.) and *Friday* (3–7 p.m.) Application for February graduation due as part of registration
August 22	Classes begin *Monday*
September 5	Labor Day (holiday) *Monday*
October 9	S.J.D. dissertations of February candidates due *Friday*
November 23	Thanksgiving recess begins after last class *Wednesday*
November 28	Classes resume *Monday*
December 3	Last day of fall-semester classes *Saturday*
December 5–16	Reading and examination period *Monday–Saturday*
January 2	LL.M. theses of February candidates due *Monday*

1978 SPRING SEMESTER

**January 5–6*	Registration *Thursday–Friday* Application for May graduation due as part of registration
January 9	Classes begin *Monday*
January 27	S.J.D. dissertations of May candidates due *Friday*
February 20	Winter Convocation (holiday) *Monday*
March 1	Application for 1978–79 teaching fellowships due *Wednesday*
March 25	Spring recess begins after last class *Saturday*
April 3	Classes resume *Monday*
April 27	Last day of spring-semester classes *Thursday*
May 1	LL.M. theses of May candidates due *Monday*
April 28–May 12	Reading and Examination period
May 21	Commencement *Sunday*

* Hours of registration to be announced.

THE NATIONAL LAW CENTER

HISTORY

THE LAW CENTER, the oldest law school in the District of Columbia, was established in 1865 with a formal program of two years of study. This was largely through the efforts of the Reverend George Whitefield Samson, President of Columbian College, whose action resulted in the purchase of a separate building for holding law classes. The building had belonged to Trinity Church, of which Francis Scott Key had been Senior Warden. It was occupied by the Law Center until 1884.

Sixty graduates, from 22 of the then 37 states, received degrees in 1867. The school continued to have a student body and a faculty which reflected the fact that it was at the seat of our nation's government. Associate Justices David J. Brewer and John Marshall Harlan of the Supreme Court of the United States were among the prominent members of the bench and bar who were on the faculty.

In 1877, one year after the first such program was adopted in the United States, the Law Center instituted a course leading to the degree of Master of Laws. In 1898, the course of instruction for the degree of Bachelor of Laws was extended to three years. The Law Center took part in 1900 in the organization of the Association of American Law Schools.

In the past quarter-century the Law Center expanded its course and seminar offerings with consideration of the needs of first-degree and graduate students. The degree of Doctor of Juridical Science was instituted in 1940. The need of foreign lawyers who came to this country and who required additional preparation for law work in the United States resulted in the creation of programs for the degrees of Master of Comparative Law in 1946 and Master of Comparative Law (American Practice) in 1951.

In 1954, National University School of Law, which had an important place in legal education in the District of Columbia since 1869, was absorbed by the George Washington University Law School.

Since 1954, programs of special research and study have enriched the basic curriculum. These include the Environmental Law Program; Patent Law Program; International Law Program; the Government Contracts Program; and the Law, Science, and Technology Program.

Additionally, the Law Center has been a leader in developing a curriculum to meet the legal needs of the poor and the disadvantaged. A clinical law



program has been developed which is the equal of that at any law school in the nation. Special projects include the Consumer Protection Center, the George Washington Legal Aid Bureau, and individual projects supervised by the Law Students Civil Rights Research Council.

Realizing the need for legal services for all members of society, the National Law Center, while maintaining its strong course offerings in patent law, administrative law, and corporate law, has developed a rich selection of courses in poverty law covering sales, civil rights, and welfare.

Alumni of the National Law Center have included United States Senators, Congressmen, Ambassadors, and Cabinet Members. Its graduates have gone on to become members of both the federal and state judiciaries as well as noted members of the bar of every state in the union.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

In accordance with the stated policy of its Board of Trustees and in conformity with federal laws and regulations, George Washington University does not discriminate against any person on the bases of sex, race, color, religion, or national origin in any of its education or employment programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 call for an explicit statement that the requirement not to discriminate on the basis of sex extends to employment in and admission to such programs and activities.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office of Civil Rights of the Department of Health, Education, and Welfare.

LOCATION IN THE NATION'S CAPITAL

Of special significance is the location of the National Law Center in the nation's capital, the focal point of the law in action, both American and international. The work of the Center goes on in this environment, presenting a unique opportunity for observation and study of federal agencies—judicial, legislative, and administrative. Readily accessible are the Supreme Court of the United States, the federal trial and appellate courts of the District of Columbia, and, in addition, federal courts of special jurisdiction, such as the United States Court of Claims, the United States Court of Customs and Patent Appeals, the Tax Court of the United States, and the Court of Military Appeals. Current federal legislation can be studied as it is considered by Congressional committees and as it comes up for debate on the floors of the House of Representatives and the Senate. With respect to the federal administrative agencies, students here in Washington have matchless opportunities for study and observation. They can attend informal and formal hearings of these agencies and can obtain from the docket sections complete records of administrative adjudication in specific cases. Illustrative of such federal agencies are the Interstate Commerce Commission and the Civil Aeronautics Board in the field of transportation; the Federal Trade Commission in the field of trade regulation; the Securi-

ties and Exchange Commission in the field of security issues and corporate finance; the National Labor Relations Board in the field of labor-management relations; the United States Patent Office in the field of patent law; the Federal Power Commission in the field of water, natural gas, and electric power; and the Federal Communications Commission in the field of radio and television.

Supplementing these environmental advantages of law in action are the exceptional research library collections in the Library of Congress, in the various departments of the federal government, and in the libraries of the headquarters of national and international organizations. The notable library of the Carnegie Foundation for International Peace has been acquired by George Washington University for use of research students in international and comparative law, fields with respect to which Washington has come to be called "The Capital of the World."

The years of residence at law school are years of participation in the life of the community, which in the case of the George Washington University National Law Center is the government of the United States. As a consequence, the study of law takes on added meaning, whether the goal be government service or practice, general or specialized, and whatever the community in which the student plans to practice.

OBJECTIVES

The purpose of the National Law Center is to prepare men and women to meet the needs of society in many fields of law. As a national law school, the Center does not emphasize any particular geographic area in its instruction; therefore, it prepares students to practice law in any part of the country. The Center also offers a program of legal education for foreign students. The Law Center seeks to fulfill these objectives through (1) a rich and varied curriculum taught by eminent professors and highly qualified specialized instructors; (2) an extensive clinical law program where students learn legal skills by actual practice; (3) two law journals which specialize in public law and international law; (4) trial practice; (5) participation in the Van Vleck Appellate Case Club (a moot court competition); (6) a series of student professional co-curricular activities; (7) studies on an advanced level for foreign as well as for American students; and (8) a continuing legal education program for members of the bar.

The National Law Center Complex

The National Law Center Complex consists of three buildings: Stockton Hall, Bacon Hall, and the Jacob Burns Law Library.

STOCKTON HALL

Stockton Hall is the main classroom building. It also holds faculty offices and the offices of the Dean and the Associate Deans of the Law Center, as well as the Records Office and student lounges.

BACON HALL

Bacon Hall houses faculty offices; student lounges; the *George Washington Law Review* Office; the Government Contracts Program; the Admissions Office; the Law Center Placement Office; the offices of the *Journal of International Law and Economics;* the Black America Law Student Association; the Law Students Civil Rights Research Council; the Van Vleck Appellate Case Club; the *Advocate,* the law school newspaper; the Student Bar Association; the Consumer Protection Center; the Legal Aid Bureau; and Movimiento Legal Latino, the national Latino law students association.

THE JACOB BURNS LAW LIBRARY

The Law Library of approximately 150,000 volumes is housed in the modern Jacob Burns Law Library Building, adjoining Stockton Hall on the south side. This facility, opened for use on October 1, 1967, comprises nine floor



and deck levels with about 49,000 square feet of floor space. Its shelf capacity now in place will accommodate over 175,000 volumes; with supplementary shelving in Stockton Hall and a small branch for the *Law Review* in Bacon Hall, the library provides space for almost 200,000 volumes. Seating for more than 500 readers is provided in four reading rooms, lounge and smoking areas, carrels, enclosed study cubicles, semi-private reading alcoves, and seminar rooms. Three photocopy machines are provided for reader use.

The collections comprise a comprehensive working library of Anglo-American law, with supplementary material in related disciplines (such as business, finance, labor relations, sociology, criminology, political science, biography, foreign affairs, and others). Special areas are maintained for collections in tax law, labor law, patent-trademark-copyright law, international law, and foreign and comparative law. Included in the collections are the appellate decisions of all states courts and decisions of the federal courts, with comprehensive collections of English and Canadian court decisions; the currently annotated statutes of the 50 states; all federal statutes; English and Canadian statutes; selected statutes of other nations; and an extensive periodical collection, kept current by more than 950 subscriptions, covering virtually all American legal periodicals and most of those published in English throughout the world. The library is strong in its treatise holdings, administrative and regulatory materials, and Congressional coverage. The growing international law holdings include virtually complete collections of United Nations printed material and that of the European Economic Community, all recent material from the International Labor Organization, and current and retrospective collections of international treaties. A large portion of the holdings of the former library of the Carnegie Endowment for International Peace, acquired by the University in 1950, is in the Law Library.

The Juris Doctor Degree Program

ENTRANCE REQUIREMENTS

For information on "Application for Admission" to the Juris Doctor degree program, see page 28. Admission to candidacy for the degree of Juris Doctor requires a Bachelor of Arts or equivalent degree from an accredited college or university, a satisfactory quality of work, and an acceptable distribution of courses. Any substantial number of hours taken on a pass-fail or other ungraded basis may be seriously detrimental to an applicant's chances for admission. Eligibility is based on personal and scholastic records and on the result of the Law School Admission Test. No applicant will be acceptable in transfer who is ineligible to return in good standing to a previously attended law school. From the applicants, a selection is made by the Committee on Admissions.

Information concerning the Law School Admission Test may be obtained from the Dean of the National Law Center or from the Educational Testing Service, 20 Nassau Street, Princeton, N.J. 08540; or 1947 Center Street, Berkeley, Calif. 94704. The test is administered at various centers in the United States. It is anticipated that the testing dates for 1977–78 will be in October,

December, February, April, and July. Completed application blanks and fees must be received by the Educational Testing Service at least two weeks before the date of the test. It is not necessary that formal application for admission be made prior to taking the test.

ADVANCED STANDING

In unusual circumstances, advanced standing toward the degree of Juris Doctor may be granted for work of high quality successfully completed in other law schools which are members of the Association of American Law Schools or are approved by the American Bar Association. Transferred credits will not be recognized in excess of those which might be earned in a similar period in the National Law Center.

Advanced standing will not be granted for law work already counted toward the Bachelor of Arts or other pre-legal degree.

TUITION DEPOSIT

Every student admitted to the National Law Center as a candidate for the degree of Juris Doctor must submit a tuition deposit ($100 initially plus $350 later) after receipt of notification of acceptance. This deposit is credited toward tuition.

PROFILE OF THE CLASS ENTERING IN THE FALL SEMESTER 1976-77

A first-year class of approximately 400 students was selected from more than 5,200 applicants from 700 colleges and universities. Applications were received from every state in the union. Thirty-nine per cent of the first-year class were women.

The following colleges and universities are each represented by three or more members of the first-year class: American University, Boston University, Bucknell University, City University of New York (Brooklyn College and Queens College), Colgate University, Columbia University, Cornell University, Dickinson College, Duke University, Emory University, Franklin and Marshall College, George Washington University, Georgetown University, Harvard University, Indiana University, Johns Hopkins University, Lawrence University, Miami University, Michigan Institute of Technology, Michigan State University, Northwestern University, Oberlin College, Pennsylvania State University, Princeton University, Rutgers University, Smith College, Stanford University, State University of New York at Albany, State University of New York at Binghamton, State University of New York at Buffalo, Syracuse University, Tulane University, University of California, Berkeley, University of Chicago, University of Delaware, University of Denver, University of Florida, University of Hawaii, University of Illinois, University of Maryland, University of Michigan, University of Minnesota, University of Notre Dame, University of Pennsylvania, University of Rochester, University of South Carolina, University of Tennessee, University of Utah, University of Virginia, University of Wisconsin, U.S. Coast Guard Academy, U.S. Naval Academy, Vassar College, Washington University, Wellesley College, Wesleyan University, Williams College, Yale University.

THE CURRICULUM

The curriculum for the degree of Juris Doctor at the National Law Center offers the candidate one of the largest and most varied selections of courses in the country. First-year students are required to take courses entitled Civil Procedure; Constitutional Law; Contracts; Criminal Law and Procedure; Legal Research, Writing, and Professional Responsibility and Ethics; Property; and Torts. These courses give students the basis upon which all further legal study is built. In the second and third years of study, students must take Evidence and fulfill a two-credit legal writing requirement. Beyond these requirements the students are free to choose from the many course and project offerings. The Law Center prides itself on allowing students freedom to design their own program of study.

The curriculum is organized so that students may begin the study of law for the Juris Doctor degree only at the start of the fall semester. Transfer students may enter at the start of the spring semester also.

Day Division

First Year

FALL SEMESTER		SPRING SEMESTER	
Contracts I	4	Contracts II	2
Torts	4	Property	4
Criminal Law and Procedure	4	Constitutional Law	4
Legal Research, Writing, and Professional Responsibility and Ethics	2	Civil Procedure	4
Total semester hours	14	Total semester hours	14

Second Year

FALL SEMESTER		SPRING SEMESTER	
Elective	14	Evidence	4
		Elective	10
Total semester hours	14	Total semester hours	14

Third Year

FALL SEMESTER		SPRING SEMESTER	
Elective	12	Elective	14
*Legal writing requirement	2		
Total semester hours	14	Total semester hours	14

*This requirement may be satisfied by service on the *Law Review*, by satisfactory completion of a seminar which requires a research paper, or by satisfactory completion of Law 344, *Legal Writing*.

Evening Division

First Year

FALL SEMESTER		SPRING SEMESTER	
Contracts I	4	Contracts II	2
Torts	4	Criminal Law and Procedure	4
Legal Research, Writing, and Professional Responsibility and Ethics	2	Civil Procedure	4
Total semester hours	10	Total semester hours	10

Second Year

FALL SEMESTER		SPRING SEMESTER	
Property	4	Constitutional Law	4
Elective	6	Elective	6
Total semester hours	10	Total semester hours	10

Third Year

FALL SEMESTER		SPRING SEMESTER	
Elective	8	Evidence	4
*Legal writing requirement	2	Elective	6
Total semester hours	10	Total semester hours	10

Fourth Year

FALL SEMESTER		SPRING SEMESTER	
Elective	10	Elective	10
Total semester hours	10	Total semester hours	10

Summer Term or Ninth Semester

Elective	4

REQUIREMENTS FOR THE DEGREE

The student must have completed a residence period of three academic years (four years for evening students) and 84 semester hours of required and elective courses, with a cumulative average of at least 65. At least one academic year of residence and 28 semester hours are required of students admitted with

* This requirement may be satisfied by service on the *Law Review*, by satisfactory completion of a seminar which requires a research paper, or by satisfactory completion of Law 344, *Legal Writing*

advanced standing. The work of the final semester or summer session must be completed while in residence at the National Law Center. Credits allowed for advanced standing are not included in computing the average required for graduation.

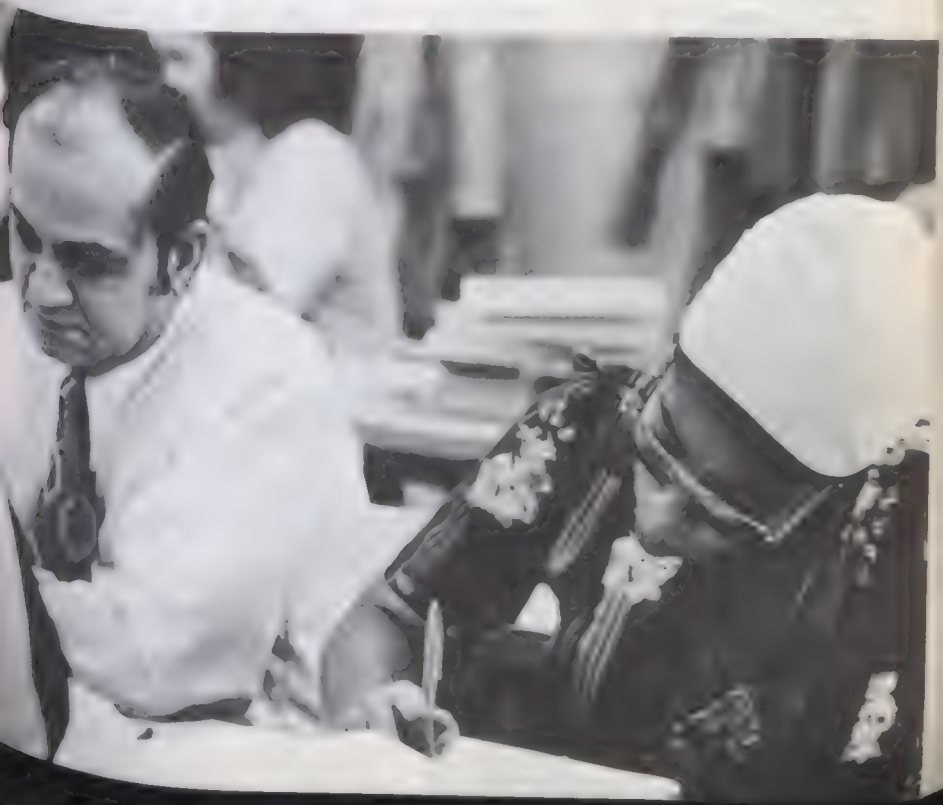
Graduation Requirements.—See page 43 for a statement of the graduation requirements.

Residence

Candidates for the Juris Doctor degree must complete a residence period of three academic years. Attendance in the day division for the fall and spring semesters constitutes residence for an academic year; similar attendance in the evening division constitutes residence for three-fourths of an academic year. Consequently, a day student must attend 6 semesters to meet residence requirements; an evening student must attend 8. Students authorized to take schedules of less than 10 hours in the day division or less than 6 hours in the evening division receive residence credit on a proportional basis. Students who attend the summer sessions receive fractional residence credit.

HONORS

The degree of Juris Doctor "With Highest Honors" is awarded to those students, not exceeding 3 per cent of the graduating class, who have obtained the highest cumulative averages of at least 85 or better.



The degree of Juris Doctor "With High Honors" is awarded to those students with the highest cumulative averages of 80 or better. The number of students receiving degrees "With High Honors," when added to the total number of students receiving degrees "With Highest Honors," may not exceed 10 per cent of the graduating class.

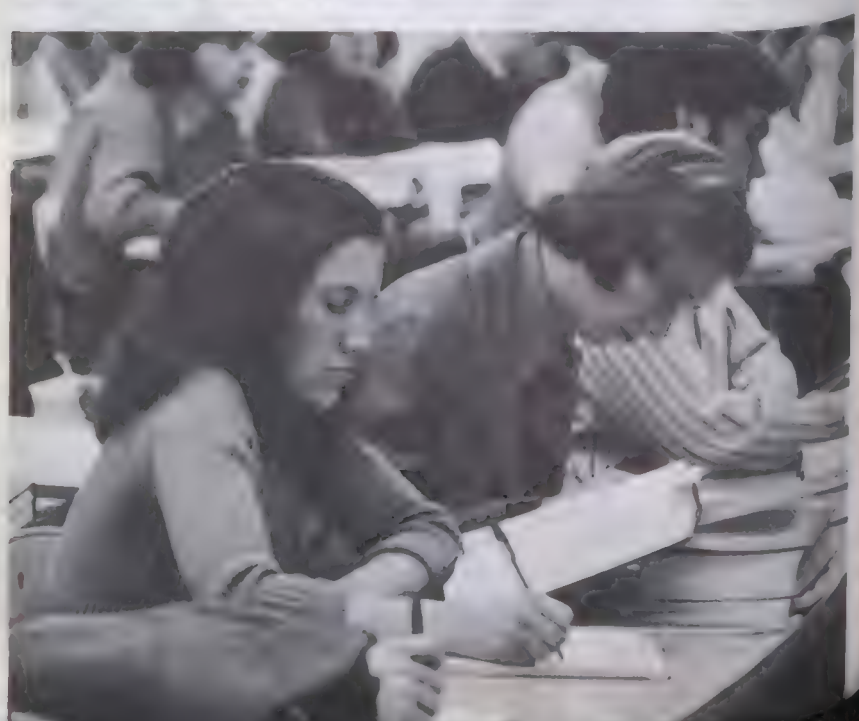
The degree of Juris Doctor "With Honors" is awarded to those students with the highest cumulative averages of 75 or better. The number of students receiving degrees "With Honors," when added to the total number of students receiving degrees "With High Honors," and "With Highest Honors," may not exceed 40 per cent of the graduating class.

ORDER OF THE COIF

The Order of the Coif, a national legal honor society, aims "to foster a spirit of careful study and to mark in a fitting manner those who have attained a high grade of scholarship." The George Washington University Chapter was established in 1926. Members are elected each year from the highest-ranking 10 per cent of the graduating Juris Doctor candidates.

PUBLICATIONS

The *George Washington Law Review*, published five times a year, is edited and managed by the students of the National Law Center. The *Law Review* is known for its emphasis on federal and public law; however, it is also devoted to research in other important legal areas. The staff of the *Law Review* is selected on the basis of a writing competition and on the basis of grades.



The editorial board is selected from those students who have successfully completed the first year of *Review* work. Students receive 4 semester hours of academic credit for the two-year program.

The *Journal of International Law and Economics*, managed and edited by law students, is a biannual publication of the Law Center. It presents articles and commentaries on public and private international financial development, comparative law, and international law. The staff of the *Journal* is selected through a writing competition, and students earn academic credit for their work.

MOOT COURT

The Van Vleck Appellate Case Club provides realistic training in appellate oral advocacy for students in the National Law Center. Each year two competitions are held: the upperclass competition is held in the fall and the first-year competition is held in the spring.

LAW CENTER ORGANIZATIONS

Black America Law Student Association (BALSA)

The Black America Law Student Association is a national Black law students organization which has chapters at some 80 law schools. BALSA sponsors law speakers and various programs.

International Law Society

The International Law Society is an organization of students interested in the practice of international law. The Society sponsors speakers and various programs.

Movimiento Legal Latino

A national Latino law students organization which has chapters at various law schools, Movimiento Legal Latino sponsors law speakers and various programs.

Law Fraternities and Sororities

The chapters of Beta Kappa Pi, Delta Theta Phi, Phi Alpha Delta, and Phi Delta Phi at the National Law Center sponsor speakers and various social occasions.

Law Students Civil Rights Research Council (LSCRRC)

The Law Students Civil Rights Research Council is a national organization of law students concerned with the legal problems of civil rights. LSCRRC offers clinical law projects for which students may receive academic credit.

Student Patent Law Association (SPLA)

The Student Patent Law Association, an organization of students interested in patent and related law, conducts an extensive speakers program as well as various social events.



Student Bar Association

The Student Bar Association is the law student governing body, responsible for allocating funds among the various student organizations. It also conducts a speaker program for the law school. All members of the student body are members of the Student Bar Association.

Tax Law Association

As an organization of students interested in careers in tax law, the Tax Law Association conducts various programs of interest to tax law specialists.

Women's Rights Committee (WRC)

The Women's Rights Committee is primarily interested in the place of women in law schools and in the legal profession. WRC conducts seminars and sponsors speakers.

Joint Juris Doctor—Master's Degree Program

In certain instances, arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a Master's degree in some fields in the University's Graduate School of Arts and Sciences, School of Government and Business Administration, or School of

Public and International Affairs. Fields in which this program is available include Business Administration, Economics, International Affairs, Political Science, Public Administration, and Public Affairs. Students must be admitted both to the National Law Center and, separately, to the School which will confer the Master's degree, and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Master's and Doctoral Programs

THE ADMINISTRATION OF JUSTICE under law is a matter so vast and complex that some who hold the Bachelor of Laws or Juris Doctor degree feel the need for further study. The Master's and doctoral programs give students the opportunity to broaden and deepen their understanding of the law.

The Master of Laws candidate may follow a program of general study or concentrate in one of the specialized areas listed below. Courses in each of these areas are included in the 401–600 series. Graduates who complete their work in one of these areas may have the field of specialization noted on their diplomas.

Administrative Law: Economic Regulation
Corporation Law
Environmental Law
Government Procurement Law
International and Comparative Law
Labor Law
Land Use Management and Control
Law and Poverty
Law, Psychiatry, and Criminology
Law, Science, and Technology
Patent and Trade Regulation Law
Taxation
Urban Legal Studies

Programs leading to the degree of Doctor of Juridical Science offer a limited number of unusually talented advanced students, who have already earned the Master of Laws degree, the opportunity to concentrate on research and writing in a specific area of interest to the legal profession.

MASTER OF LAWS

Entrance Requirements

A Bachelor of Laws, Juris Doctor, or equivalent degree from a law school which is a member of the Association of American Law Schools or is approved by the American Bar Association is required. The applicant must have demonstrated a high degree of academic excellence. Advanced standing is not granted for credits earned while a candidate for the first degree in law or for credits earned at other law schools.

Degree Requirements

The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in this Law Center and in a period not exceeding three years from the time of initial graduate registration, unless an extension is granted in writing by the Dean. The student must complete 24 semester hours of courses and writing projects with acceptable grades. For all courses taken within the Law Center a student must attain the grade of 65 or above. For approved courses taken outside the Law Center, the grade of either *CR* (Credit) or *NC* (No Credit) is assigned. To receive the grade of *CR* (Credit) in a course taken in other graduate divisions of this University, a student is required to attain the grade of *B* or better. To receive the grade of *CR* (Credit) in a course taken at Georgetown University through the Consortium of Universities of the Washington Metropolitan Area, Inc., a student is required to attain the grade of 80 or better. A minimum cumulative average of 78 is required at all times for all LL.M. candidates admitted or readmitted after February 1976, or completing their degree requirements after February 1979. For candidates registered prior to February 1976, and continuously registered since, who receive their degree on or before February 1979, the minimum cumulative average is 75. The student is expected to include Law 599–600 *Thesis* in the 24-semester-hour requirement for the degree (for exception, see "Master's Thesis," below).

Candidates for the degree in a selected field of specialization must complete a minimum of 12 of the required 24 semester hours in courses and writing projects related to the selected field. Each Master of Laws program of study may include a limited number of courses numbered in the 300 series, with the approval of the Dean.

The only credit hours that may be applied to any Post-J.D. degree are those completed while a duly enrolled candidate for that specific degree, with the following exceptions: (1) an unclassified student who has been admitted with the specific right to convert to degree status at the end of a specified number of hours, and (2) S.J.D. candidates who have fulfilled the 8-hour course requirement as unclassified students.

MASTER'S THESIS

Each candidate for the degree of Master of Laws is expected to write a Master's thesis (Law 599–600) under the supervision of a full-time member of the faculty of the National Law Center. Four hours of credit will be granted for successful completion of the thesis. The purpose of this requirement is to demonstrate the ability of the student to perform research in a special area of the law and to produce a scholarly paper containing the results of this research. The thesis is expected to be of substantially the same quality as a Law Review article. The Dean may waive the thesis requirement upon written request of the student, submitted no later than the beginning of the *final semester or summer session* before the student's graduation, provided the student has demonstrated research and writing ability by taking a minimum of 6 semester hours of course work at the National Law Center designated "Research Paper." No thesis waiver is granted for candidates for the degree of Master of Laws with specializations in international law or government procurement law.

The thesis in its final form must be presented to the adviser no later than the date specified in the Calendar. Two complete copies are required. It is the responsibility of the candidate to obtain from the Post-J.D. Programs Office a printed copy of the regulations governing the styling and reproduction of theses. The mandatory thesis binding fee of $10 must be paid at the time of registration for the last semester's work.

Accepted theses become the property of the University and are placed in the University Library and the Law Library, where the duplicate copies are bound and made available for circulation.

Honors

The degree of Master of Laws "With Highest Honors" is awarded students who obtain a minimum cumulative average of 85.

Graduate Courses in Other Departments

Master of Laws candidates may be permitted to take graduate courses related to their fields of interest in other departments of this University. A maximum of 6 semester hours will be credited toward the degree for such courses; however, credit will be granted only if the courses are given on campus. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. Courses numbered 101–200 may be taken for graduate credit only if the student receives the approval of the instructor at the time of registration and does additional work, as prescribed by the department offering the course.

Consortium of Universities of the Washington Metropolitan Area, Inc.

A candidate for the Master of Laws degree may take graduate courses at Georgetown University Law Center through the Consortium of Universities of the Washington Metropolitan Area, Inc. A maximum of 6 semester hours of such courses may be credited toward the degree. Permission to take Consortium courses must be granted by the Dean, the Registrar, and the instructor offering the course. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. To receive the grade of *CR* a student must attain a numerical grade of 80 or higher.

DOCTOR OF JURIDICAL SCIENCE

Entrance Requirements

Admission to candidacy for the degree of Doctor of Juridical Science requires a Bachelor of Arts or equivalent degree from an approved college or university; a Bachelor of Laws, Juris Doctor, or equivalent degree, earned with high rank, from a law school which is a member of the Association of American Law Schools or is approved by the American Bar Association; a Master of Laws degree with high academic standing; outstanding capacity for scholarly work in the field of law; and faculty approval of the applicant's dissertation topic. Applicants must also demonstrate their writing ability by submitting the Master's thesis or a copy of one or more papers or articles which the applicant has written. Following consultation with the Dean, the applicant must obtain a faculty adviser, to be designated "committee chairman," from the regular,

full-time faculty; reach agreement on the acceptability of the proposed topic for the dissertation; and submit a detailed outline for the adviser's approval, indicating by chapter and division within chapter the exact scope of the project. There should be a bibliography for each chapter, listing books, reports, cases, and law review articles to be considered. Although the outline cannot predict every detail of the subsequent research, it must be sufficiently definite to afford the Graduate Board a basis for evaluation.

Once the outline is approved, the applicant's "committee" is expanded to three members; this consultative committee must recommend the acceptance of the applicant to the full Graduate Board. The Board then acts upon the recommendation and may either accept or reject the applicant as an S.J.D. candidate. In no instance will any applicant be admitted to degree candidacy prior to the above procedures; however, the applicant may be registered as an Unclassified Student for purposes of course work requirements (see below). Approval for degree candidacy must be received within one year of the appointment of an adviser unless a written extension is granted by the Dean.

Degree Requirements

The candidate must complete (1) a residence period of not less than one academic year; (2) a course of study and research—designated by the consultative committee and approved by the Graduate Board—of no less than 8 semester hours including *Jurisprudence*, unless previously taken; and (3) an acceptable dissertation. The dissertation must be submitted no later than three years from the date of admission to candidacy for the S.J.D. degree. The applicant who proposes to write on a comparative law topic must have a reading knowledge of the language in which the relevant materials are to be found. When the dissertation is submitted, the consultative committee will set the date for an oral examination. This examination is conducted by the consultative committee and such other members of the faculty and qualified experts as are selected by the Graduate Board.

No later than the date specified in the Calendar (see page 5), the candidate must submit to the Dean two complete copies of the dissertation and two copies of an abstract (not to exceed 600 words) of his dissertation.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation and preparation of the abstract are available in the Office of the Dean. To be acceptable the dissertation must, in the opinion of the examining committee, constitute a substantial contribution to the field of law concerned and be suitable for publication. Additional information will be supplied by the Dean. Accepted dissertations become the property of the University and are placed in the University Library and the Law Library, where the duplicate copies are bound and made available for circulation.

Degree Programs for Foreign Students

THE NATIONAL LAW CENTER has several programs of study available to students trained in law outside the United States. These programs fall into two general categories: (1) those directed toward preparing students for a bar examina-



tion in an American jurisdiction and (2) those that enable students to return to their countries with a more thorough understanding of some aspects of American law.

A student with a degree from a foreign law school who has met the extremely competitive admissions criteria will be admitted to the Center as a candidate for the Master of Comparative Law (Foreign Practice) (M.Comp.L. [For. Prac.]) or Master of Comparative Law (American Practice) (M.Comp.L. [Am. Prac.]) degree.

To prepare for admission to the bar of an American jurisdiction, the student may apply for either the Juris Doctor or the Master of Comparative Law (American Practice) degrees. The J.D. degree requires 84 semester hours of work in law school (credit is given for work in a foreign law school only in exceptional circumstances) and will qualify the student to take most U.S. bar examinations. *Students are cautioned to ascertain the requirements of the bar for which they intend to qualify prior to selection of their law school programs.*

Foreign students planning to return to their home countries may undertake a program leading to the degree of Master of Comparative Law (Foreign Practice). This degree program enables the student to gain a broader comprehension of the American legal system by taking basic courses in the Law Center. However, it is not intended to qualify a student to take a U.S. bar examination.

ADMISSION PROCEDURE

Application must be received from *foreign applicants* no later than June 1 for the fall semester (March 1 for candidates for the Juris Doctor degree), November 1 for the spring semester, and March 1 for the summer sessions.

Required Records

Applicants must request all educational institutions attended to send directly to the Dean official credentials listing subjects studied, grades received, examinations taken, and degrees received. Original diplomas, certificates, and transcripts from secondary schools and all colleges and universities attended

are required, but in exceptional cases certified copies will be accepted. Records of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

Language Test

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* and attain as an absolute minimum the score of 550 to be considered for admission to the National Law Center. This is a mandatory requirement. Students are responsible for making arrangements for taking the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08540, U.S.A. The completed application form should be returned to the Testing Service at Princeton well in advance of the beginning of the semester for which the applicant seeks admission. The test fee, which should be remitted with the application, entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does *not* constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Dean's Office.

ENTRANCE REQUIREMENTS

For the Degree of Juris Doctor.—Entrance requirements for foreign students are the same as those stated on page 11, except that advanced standing is rarely granted for study in foreign law schools.

For the Degrees of Master of Comparative Law (Foreign Practice) and Master of Comparative Law (American Practice).—The entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycee, or liceo; and graduation in law with high academic standing from a recognized foreign university.

For the Degree of Master of Laws.—A foreign student will only be considered for admission to the Master of Laws program if he or she has a juris doctor or post-juris doctor degree in law with high academic standing from an American university.

For the Degree of Doctor of Juridical Science.—The usual entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycee, or liceo; graduation in law from a recognized foreign university; outstanding capacity for scholarly work in the field of law; and a Master of Laws degree with high academic standing from an American university.

DEGREE REQUIREMENTS

Juris Doctor, Master of Laws, Masters of Comparative Law, and *Doctor of Juridical Science.*—Degree requirements for foreign students are the same as those stated on pages 14–15, 20, and 22.

Master of Comparative Law (Foreign Practice).—The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in a period not exceeding three years from the time of registration for the degree. The student must complete satisfactorily 24 semester hours of approved courses of the Center, or of such other departments of the University as the faculty of the Center shall approve, and must maintain a cumulative average of at least 55. A cumulative average of 65 is required for those admitted after the spring semester 1977.

Master of Comparative Law (American Practice).—The requirements for this degree are the same as those for the degree of Master of Comparative Law (Foreign Practice) except that this degree requires 28 semester hours of course work with a cumulative average of at least 65.

Unclassified Students

TWO TYPES OF STUDENTS may be admitted to the National Law Center as Unclassified Students, in accordance with the following regulations:

1. A candidate for a Bachelor of Laws or Juris Doctor degree with an above-average record at another law school which is a member of the Association of American Law Schools or is approved by the American Bar Association, may at the discretion of the Dean, be admitted as an Unclassified Student to earn credits for transfer to the other law schools. Such students are normally admitted only to the summer sessions. They are admitted to the fall or spring semester only in unusual circumstances.

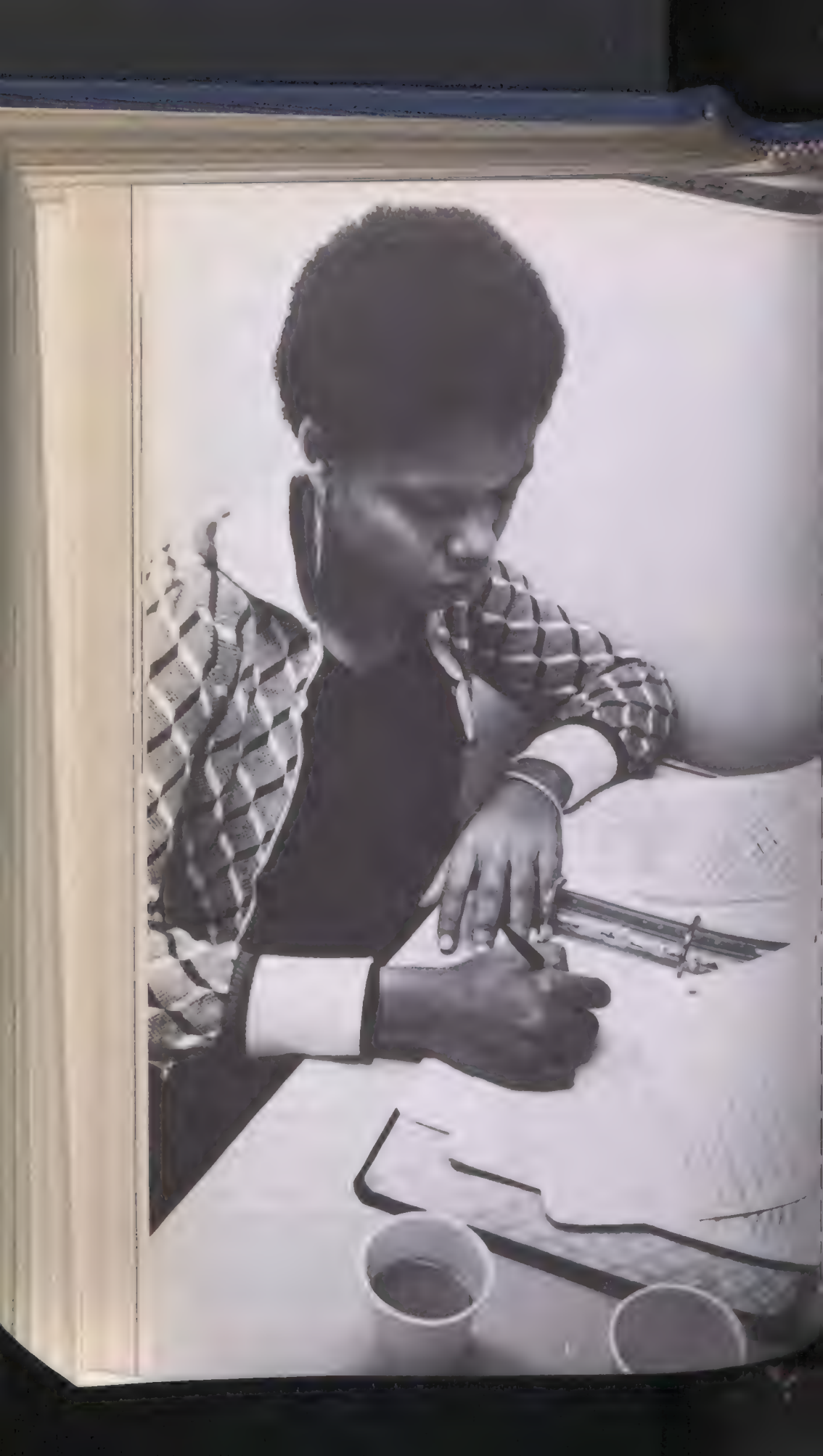
2. Graduates of law schools which are members of the Association of American Law Schools or are approved by the American Bar Association who wish to take advanced courses without pursuing degree programs may be admitted as Unclassified Students.

Unclassified Students participate in the work of the course, take examinations, and have their grades recorded. Credit for work earned as an Unclassified Student may not be applied to satisfy the requirements for a degree program unless express written approval is granted by the Dean at the time of admission.

Continuing Legal Education

MEMBERS OF THE BAR wishing to keep abreast of current developments in the law may register for any of the courses in the National Law Center on a non-credit basis as Continuing Legal Education students. Such students do not take examinations in courses and no grades are recorded for their work.

A simplified admission and registration procedure is used and must be completed on or before the last day of regular registration for the appropriate semester. Continuing Legal Education students pay only the tuition fee on the semester-hour basis. They may not participate in student activities or benefit from the medical privileges of the University. (Continuing Legal Education registrations are subject to cancellation if courses are filled by regularly registered students.)



GENERAL INFORMATION

THE NATIONAL LAW CENTER has an enrollment of about 1,700 for the J.D. and Post-J.D. degree programs. Approximately 1,000 students are enrolled in the full-time day division for the J.D. degree and 400 are enrolled in the part-time evening division. Three hundred students, many from abroad, are enrolled in the Post-J.D. degree programs.

DAY AND EVENING CLASSES

Day classes meet in the mornings in 50-minute periods and in the afternoons in 50-minute periods and also in sessions of two 50-minute periods, Monday through Friday. Trial Practice Court and certain other courses meet for two-hour periods on Saturday mornings.

Evening classes meet from 5:50 to 7:40 p.m., Monday through Friday. A four-credit course, e.g., Evidence, meets two evenings a week; a three-credit course, e.g., Administrative Law, meets two evenings a week for one-half the semester and one evening for the other half; a two-credit course, e.g., Contracts II, meets one evening a week. The evening division conforms to the standards of the day division, the full-time faculty participating in the instruction.

Examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be given in the evening.

SUMMER TERM

A term of two sessions, with day and evening classes, is offered in the summer. Students may register for either or both sessions. *No beginning students are admitted to the Juris Doctor program in the summer term.*

The summer term is shorter than a semester of the academic year, and, as a consequence, a student must attend two and one-half summer terms to receive residence credit for one academic year or attend one and one-half summer terms to receive residence credit for a semester.

A maximum of 6 semester hours may be taken each session by day students. Day students receive four-tenths of a semester of residence credit for each session of the summer term in which they are registered for 3 or more semester hours. A maximum of 4 semester hours may be taken each session by evening students. Evening students receive three-tenths of a semester of residence credit for each session of the summer term in which they are registered for 2 or more semester hours.

Admission

APPLICANTS ARE URGED to submit application forms and complete credentials well in advance of the semester for which they seek admission. In the selection process, there is no discrimination against any applicant because of sex, race, color, religion, or national origin. An application fee of $25 for a degree candidate, $5 for an Unclassified Student, must accompany the application.

Forms for application for admission or readmission are available at and should be returned to the Office of the Dean of the National Law Center, George Washington University, Washington, D.C. 20052.

For further details concerning students from foreign institutions, see pages 22–25.

APPLICATION FOR ADMISSION

Juris Doctor Program.—Beginning students are admitted only at the start of the fall semester.

The applicant should register with the Law School Data Assembly Service (LSDAS) by completing and mailing the registration form supplied with each application blank. A transcript from each college or university attended should then be sent directly to LSDAS, Educational Testing Service, Box 944, Princeton, New Jersey 08540. No transcript should be sent to the National Law Center. The LSDAS will analyze the transcript and send a copy to this law school and others designated on the registration form. If the transcript which has been forwarded to LSDAS does not show evidence of receipt of a Bachelor's degree, the applicant will be asked, upon acceptance, to submit a final transcript directly to the National Law Center.

To provide time for the evaluation of credentials of beginning students, all papers, including the Law School Admission Test score, should be received by the National Law Center before March 1. This means that the October or December Law School Admission Test should be taken (see "Entrance Requirements," page 11.

All papers of transfer students should be received by the Office of the Dean no later than May 1 for the fall semester, December 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

For additional information, see the official *Pre-Law Handbook*, 1976–1977 edition, available in October, 1976, and prepared by the Law School Admission Council and the Association of American Law Schools. This book includes material on the law and lawyers, pre-law preparation, applying to law schools, and the study of law, together with individualized information on most American law schools. It may be obtained at college bookstores or ordered from Educational Testing Service, Princeton, New Jersey 08540.

Master's and Doctoral Programs.—Students are admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions.

Application for admission, together with all required credentials, must be received by July 1 for the fall semester, December 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

Unclassified Students.—Lawyers who wish to take graduate courses are

admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions. Students who wish to earn credits for transfer toward a Bachelor of Laws or Juris Doctor degree at another institution may be admitted to the summer sessions if they are students in good standing at an accredited law school and have shown unusual ability in their law studies; they are admitted to the fall or spring semester only in unusual circumstances.

1. Application for admission, with required credentials, for a student who wishes to earn credits for transfer toward a Bachelor of Laws or Juris Doctor degree at another law school (see page 25), should be received at the Office of the Dean at least one month prior to the first day of registration for the semester or summer session for which application is made.

2. Application for admission, with required credentials, for lawyers who wish to take graduate courses (see page 25), should be received at the Office of the Dean by July 1 for the fall semester, December 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

READMISSION

A student who was previously registered but did not attend during the most recent semester (summer term excluded) should file an application for readmission. Closing dates for readmission are the same as those for admission (see "Application for Admission," page 28).

If the student has attended one or more higher institutions during his absence from the University or if he applies as a degree candidate and was previously a nondegree student, he must have complete, official transcripts sent to the Dean.



Registration

BEFORE ATTENDING CLASSES each student must register in person. No student will be registered until proper credentials have been filed and approved (see "Admission").

No registration is accepted for less than a semester or one summer session.

A student may not register concurrently in George Washington University and another institution. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration.*

ELIGIBILITY FOR REGISTRATION

A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student.—Upon receipt of a *final letter* of admission a new student is eligible for registration on the stated days of registration.

Readmitted Student.—A student previously registered who was not registered for courses during the preceding semester or summer session must apply for and receive a letter of readmission (see "Readmission," above) before becoming eligible for registration.

TIME AND PLACE OF REGISTRATION

Registration is held in Stockton Hall, 720 Twentieth Street, N.W., during the following priods: *fall semester,* August 18 and 19, *spring semester,* January 5 and 6.

A late-registration fee of $15 is charged each student who is permitted to register after the regular registration days.

Registration may be changed only with the permission of the Dean.



Fees and Financial Regulations

THE FOLLOWING FEES AND FINANCIAL REGULATIONS were adopted for the academic year 1977–78, and summer 1977. (See page 32 for projected tuition and fee increases for 1978–80.)

Tuition Fees

For the Juris Doctor's Degree:	
Full-time program (11 or more hours*), each semester	
For students enrolled as full-time students in 1975–76 for the J.D. degree, who obtain the degree no later than May 1978	$1,400.00
For all other students	1,550.00
Part-time program, for each semester hour	
For students enrolled in 1975–76 for the J.D. degree who obtain the degree no later than May 1979	105.00
For all other students	120.00
For all other students (except Doctor of Juridical Science) including Master's degrees and Continuing Legal Education:	
Full-time program (11 or more hours*), each semester	1,550.00
Part-time program, for each semester hour	120.00
Doctor of Juridical Science,† including the final examination	2,900.00
Summer Sessions 1977:	
For the Juris Doctor's Degree	98.00
For all other students	100.00

University Center Fee (nonrefundable)

For students registered for 11 or more semester hours:	
Each semester	50.50
For students registered for less than 11 semester hours in a semester:	
For each semester hour for which the student registers	4.75
For students maintaining "continuous registration" status:	
Each semester	4.75

Graduation Fees

Juris Doctor, Master's, Doctor's degrees	25.00
Fee for binding Master's Thesis	10.00

Residence Hall Fees (See page 47)

Special Fees

Application fee (degree candidate), nonrefundable	25.00
Application fee (unclassified student), nonrefundable	5.00
Application fee for room reservation, nonrefundable	100.00
Tuition deposit fee charged each student admitted to J.D. degree candidacy (payable in two installments—$100, nonrefundable, by a date specified in the letter of admission, $350 by June 1)	450.00
Late-registration fee, for failure to register within the designated period	15.00

* With the prior permission of the Dean, a J.D. degree candidate may take more than 14 semester hours after the first year of study.

† The tuition fee is to be paid at the rate of $725.00 a semester for four successive semesters, exclusive of the summer term or terms. No "continuous registration" fee will be charged if a third year is needed for completion of the degree requirments. If the Faculty should approve an extension of time, the student must maintain continuous registration and pay the continuous registration fee.

Continuous Registration fee, for post-J.D. students, to maintain "continuous registration" during any semester of absence from the University or after completion of tuition requirements.* Due and payable on the official days of registration	$120.00
Late-payment fee, charged for failure to make payments when due (see "Payment of Fees," below)	15.00
Replacement of lost or stolen picture identification card	2.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," below)	35.00
Returned check fee, charged a student whose check is returned because of insufficient funds or for any other reason	15.00
Transcript fee, for each transcript of record	2.00

Registration on campus in the University entitles each student to the following University privileges: the services of the Student Career Services Office; the use of the University Library; gymnasium privileges; admission to all athletic contests, unless otherwise specified; subscription to the *University Hatchet*, the student newspaper; admission to University debates; medical attention as described under Student Health Service. These privileges terminate and a student is no longer in residence upon withdrawal or dismissal from the University.

PROJECTED TUITION AND FEE INCREASES 1978–80

In order that students and their parents may plan more realistically, tuition increases for the academic years 1978–79 and 1979–80 have been estimated as follows:

†Increase by year (full-time students):	
1978–79 All students except Doctor of Juridical Science	$500.00
1978–79 Doctor of Juridical Science	800.00
1979–80	500.00
Increase by semester hour (part-time students):	
Students enrolled prior to Fall Semester 1976 who obtain the degree no later than May 1979—	
1978–79	5.00
For students entering in or after Fall Semester 1976	
1978–79	25.00
1979–80	20.00

It is not possible to project future economic data with certainty. The increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and

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* The continuous registration fee applies toward neither financial nor residence requirements for the degree. This fee does not apply to students granted military leave (see page 44).

† These yearly increases are also projected for the total fee for work leading to the degree of Doctor of Juridical Science.

postal money orders should be made out to George Washington University with student identification number shown in upper left hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting him to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before October 26, 1977 (for the fall semester), and March 8, 1978 (for the spring semester). Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $600.00 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits his right to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

PREPAID AND DEFERRED PAYMENT PLANS

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the Dean. Withdrawal from

* Regulations covering withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes.*

courses is permitted after the midpoint of a semester only in extraordinary circumstances. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:

FALL SEMESTER*

Withdrawal dated on or before August 26, 1977	90 per cent
Withdrawal dated August 29 to September 9, 1977	75 per cent
Withdrawal dated September 12 to September 23, 1977	50 per cent
Withdrawal dated after September 23, 1977	none

SPRING SEMESTER

Withdrawal dated on or before January 13, 1978	90 per cent
Withdrawal dated January 16 to January 27, 1978	75 per cent
Withdrawal dated January 30 to February 10, 1978	50 per cent
Withdrawal dated after February 10, 1978	none

2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference in charges between the original program and the adjusted program continuing in effect.
3. A student enrolled in a full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. A student who is granted military leave before completing the semester will receive credits for current charges in accordance with the schedule for complete withdrawal from the University (see No. 1, above). Payments made in excess of the nonrefundable balance will be refunded to the student. The nonrefundable balance will be maintained as a deferred credit for use by the student when he returns to the University (see "Military Leave," page 44).
5. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

In no case will tuition be refunded or reduced because of absence from classes.

Payment applies only to the semester for which a registration charge is incurred and will not be credited to another semester (exception: students granted military leave, see page 44).

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

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* No refund of the $100 deposit required of entering students is granted.



Financial Aid

THE NATIONAL LAW CENTER has been able in recent years to assist many students in obtaining the financial aid they require, through full or partial scholarships, various loan programs, part-time employment, or a combination of these kinds of assistance.

GRADUATE AND PROFESSIONAL SCHOOL FINANCIAL AID SERVICE

The National Law Center participates in the Graduate and Professional School Financial Aid Service (GAPSFAS), which provides an analysis of an applicant's financial needs. Entering students wishing to receive financial aid should request the materials from GAPSFAS, Education Testing Service, Box 944, Princeton, New Jersey 08540. The information provided by the applicant and the applicant's parents will be analyzed, and a copy of the report will be sent to the Law Center. In addition, students entering the National Law Center who desire to be considered for a scholarship must submit a letter to the Law Center by March 1 outlining their academic qualifications, their extracurricular activities, and their reasons for believing a scholarship award to them is justified.

Students needing financial assistance should file with GAPSFAS in time for their reports to be received at the Law Center as early as possible since the Committee on Student Financial Aid of the Center will begin making awards in March, and available funds are limited.

No awards will be made to an entering student until admission has been finalized.

JURIS DOCTOR PROGRAM

Scholarships and Research Assistantships

Application and correspondence concerning scholarships and research assistantships should be sent directly to the Dean. Unless otherwise specified, application and supporting credentials should be submitted no later than March 1 preceding the period for which the award is made.

Arent, Fox, Kintner, Plotkin & Kahn Scholarship (1973).—Scholarship aid for needy law students from the Washington, D.C., area.

Mildred Gott Bryan Scholarship Fund (1965).—Partial scholarship aid for students in the National Law Center.

Charles Worthington Dorsey Memorial Scholarship (1947).—Memorial to Charles Worthington Dorsey, LL.B. 1881, LL.M. 1882. A full-tuition scholarship for the course leading to the degree of Juris Doctor, awarded to a needy and promising graduate of this University with a Bachelor of Arts or equivalent degree. Ordinarily this scholarship is awarded once every three years.

Honor Scholarships.—Two scholarships available each year to students entering upon full-time study. Each scholarship provides a cash award for the first year, in addition to tuition aid, in an amount depending on need, for all three years. These scholarships are awarded on the basis of outstanding college records, both academic and extracurricular; Law School Admission Test scores and need. To retain the scholarship for the second and third years, the candidates must maintain a *B* average, both for each year and cumulative.

Law Center Tuition Remission.—For students from minority groups, based on financial need.

Phi Delta Delta Scholarships (1959).—Zeta Chapter of Phi Delta Delta Legal Fraternity (International), provides tuition aid to a student in the second year



of the Juris Doctor program who excelled in scholastic achievement and service to the Center in the first year.

Trustee Scholarships.—Scholarships awarded each year to entering students, for tuition aid, in an amount depending on need, in the morning division. Candidates must have demonstrated qualities of leadership, in addition to scholastic attainment. To retain the scholarship, the successful candidate must maintain a *B* average, both for each year and cumulative. Application must be made to the Dean before March 1.

Tuition-aid scholarships are also available to continuing second- and third-year full-time students with demonstrated scholastic ability, on the basis of financial need and capacity for leadership. Application should be made to the Dean prior to June 1.

Frank S. Whitcomb Scholarship Fund (1971).—Bequest of Frank S. Whitcomb for the purpose of aiding and assisting worthy young men and women in securing a legal education.

Graduate Fellowship Information Center.—Students may also wish to visit the Graduate Fellowship Information Center (2025 H St., N.W.) for additional information on fellowships and grants.

Loan Funds

Through the generosity of friends of the University a number of loan funds are available. Among them are the Lyle T. Alverson Loan Fund; the Robert Ash Loan Fund; the George R. Beneman Loan Fund; the Morris and Gwendolyn Cafritz Foundation Minority Law Student Loan Fund; the Robert M. and Mary McConnel Cooper Loan Fund; the Robert McKinney Cooper Memorial Loan Fund; the J. Forrester Davison Loan Fund; the District of Columbia Bar Association Loan Fund; the J.W. Ehrlich Foundation Loan Fund; the Newell W. Ellison Loan Fund; the Harold L. and Violet George Foundation Loan Fund; the George Washington Law Association Loan Fund; the Morris Golub Loan Fund; the Jephson Educational Trust Loan Fund; the Law Association Loan Fund for the law classes of 1912, 1918, 1921, 1924, 1929, 1931, 1933, 1935, 1936, 1937, 1938, 1939, 1941, 1942, 1945, 1950, 1951, 1952, 1953, 1955, 1959, 1960, 1961, 1962, 1963, 1964, 1965; the Law School Loan Fund; the Oscar Lawler Memorial Loan Fund; the Horace L. Lohnes Memorial Assistance Fund; the Jessie B. Martin Loan Fund; the Robert N. Miller Loan Fund; the Joan Murphy Loan Fund; the Mike Pelekiri Loan Fund; the Phi Delta Delta Loan Fund; the W. Theodore Pierson Loan Fund; the Rockport Loan Fund; the Samuel L. Samuel Loan Fund; the Orville Hassler Walburn Memorial Loan Fund; the Ruth F. Wilson Loan Fund; and the Yadao and Kanemoto Loan Fund.

In addition, financial assistance is available through the Guaranteed Student Loan Program, National Direct Student Loans, the American Bar Association Loan Program, and other sources.

Application for financial assistance should be made in the Office of the Dean.

MASTER'S AND DOCTORAL PROGRAMS

Fellowships and Scholarships

Application should be made before March 1 preceding the period for which the award is made. The applicant should submit an application for admission

as a degree candidate and a personal letter applying for a fellowship to the Dean. The letter of application should contain complete biographical data, information as to experience in practice or teaching, and copies of or citations to published legal writings, and such other information the student believes will be of assistance in the consideration of the application. Applicants should arrange for letters of recommendation to be sent from two members of their law faculty directly to the Dean. The applicant's academic rank in class should be included either in the transcript of the law school or in the letters of recommendation.

Teaching Fellowships.—Three or four fellowships available each year with a stipend of $8,000 plus tuition for an approved course of study leading to an advanced degree. Teaching fellowships are awarded for a term of two academic years. Fellows conduct the first-year course in Legal Research and Writing and work with the students to improve their legal writing ability. By arrangement with the Dean, they may also be given the opportunity to teach additional courses.

Richard Paul Momsen Scholarships for Brazilian Graduate Law Students.—Bequest of Richard Paul Momsen, LL.B. 1912. Awarded 1976–77 and alternate years, for the study of U.S. constitutional law and the law of patents and trademarks.

Prizes

Jacob Burns Prize.—Established by Jacob Burns, a law alumnus and Trustee of the University. A medal and $100 awarded annually to each of the two members of the winning team in the upperclass Van Vleck Moot Court competition.

Ogden W. Fields Graduate Prize.—Fifty dollars awarded annually to the graduate student who has demonstrated the highest overall proficiency in a course in labor law.

Charles Glover Prize.—Established by Charles Carroll Glover, Jr., an Honorary Trustee of the University, in memory of his great-grandfather, an illustrious member of the bar of the District of Columbia. Consists of selected law books. Awarded annually to the student who has attained the highest average grade in the third-year, full-time course.

Kappa Beta Pi Prize.—Awarded by Eta Alumnae Chapter to the woman law student who attains the highest average for the first year.

John Bell Larner Prize.—By bequest, a medal awarded annually to the member of the graduating class who attains the highest average grade in the entire course for the degree of Juris Doctor.

John Ordronaux Prizes.—By bequest, $75 awarded annually to the student who has attained the highest average grade in the first-year, full-time course; and $75 to the student who has attained the highest cumulative average grade at the end of the second-year, full-time course.

United States Law Week Award.—Presented to an outstanding senior law student.

Jennie Hassler Walburn Prize.—A cash reward to the outstanding student in the field of civil procedure, established by the will of the late Professor Orville Hassler Walburn in memory of his mother.

ACADEMIC WORK LOAD

Juris Doctor Candidates.—Juris Doctor candidates without substantial outside employment may take a program of studies of 14 hours a week. Such students may take courses in the evening only if they are not scheduled in the daytime and if a majority of the hours taken are in day courses. The Dean is authorized to approve programs of study of more than 14 hours in exceptional cases; however, no program will be approved which would permit the student to complete requirements for the degree in less than 28 months after beginning the first year of law study. Students with 20 hours or more of outside employment, whether in the day or evening division, must take a limited program of studies not exceeding 10 hours a week. Students taking a majority of their classes in the evening may not take more than 10 hours a week; the minimum load is 8 hours, except in special cases where 6 may be approved by the Dean for a limited time. A minimum schedule of 11 hours in the day division is required except in exceptional circumstances when a reduced program is authorized by the Dean.

Students taking more than 8 hours in the day division or 4 hours in the evening division must have the permission of the Dean to take a Bar Review course.

Students may transfer from the day division to the evening division only with the permission of the Dean.

With the approval of the Dean, second- and third-year students may take a maximum of 6 semester hours of appropriate courses in other departments of the University; such a student must receive a grade of at least *B* to obtain credit for such courses, and in no event will the grade count in computing the cumulative average.

Master's Candidates.—Master's candidates without substantial outside employment may take a maximum of 12 hours a week. Students with 20 hours or more of outside employment must take a limited program of study not to exceed 8 hours a week. The minimum load is 4 hours unless approval for fewer hours is given by the Dean for a limited time.

ATTENDANCE

Regular attendance at classes is required and is necessary for successful work. A student who is deficient in class attendance in any course may be barred from taking the examination.

CHANGES IN PROGRAM OF STUDIES

A student may not add courses or change from one section to another of the same course without the approval of the Dean. Students may drop courses only with the written approval of the Dean. In addition, approval of the instructor is ordinarily required unless the request is made early in the semester. Under no circumstances may any student drop a course after the last day of classes in any semester or summer session.

RESEARCH PAPERS

The preparation of a research paper is required in lieu of an examination in seminars and in other courses, as indicated in the course descriptions. Any research paper must be submitted by the first day of the examination period (the first day any examination is given in any course). For sufficient reason, the instructor may extend the time beyond this date to a later date, subject to the following conditions: (1) no student will receive any credit for the course for any purpose until a paper acceptable to the instructor has been submitted; (2) if a paper is submitted after the last day of examinations (or the last Wednesday before registration for the spring semester), the only grade the student may receive for the course is *CR* (Credit) or *NC* (No Credit), except that failure ultimately to submit any paper for the course will result in a grade of 45. Students who are candidates for the J.D. degree may register for one course requiring a research paper in each semester of their third year; with the approval of the Dean such students may register for more than one such course each semester. Approval of the Dean is required for second-year students to take such courses.

EXAMINATIONS

Written examinations are held at the end of most courses. Every student is required to take the regular examinations unless excused. No excuse for absence will be granted except by the Dean and then only for illness or other emergency. Application for excuse must be made in writing not later than one month after the date of the examination. A student excused from a final examination will be permitted to apply to the instructor for a Credit/No Credit determination. The instructor will select the mode of determination (for example, a make-up examination or paper). The student will have the option of (1) complying (prior to the completion of the semester following the excused absence) with the instructor's procedure of determining Credit/No Credit, or (2) having the grade *I* (Incomplete) entered on the record and taking the next regularly scheduled examination for a numerical grade. The examination may not be taken after exclusion for low scholarship.

Permission to take an examination before the regularly scheduled date will not be granted. Permission to take a postponed examination is limited to the situations provided for in the preceding paragraph.

A student who has been excused from taking a regular examination and who is a candidate for a degree to be conferred prior to the next regular examination in the subject may petition the Scholarship Committee, which may authorize such action as the circumstances require.

If a student fails to take an examination, a grade of 45 will be recorded unless the student has been excused from the examination as provided above or has obtained the Dean's permission to drop the course.

CREDIT/NO CREDIT OPTION

Candidates for the degree of Juris Doctor may take, in addition to courses regularly given on a "Credit/No Credit" basis, 12 semester hours of elective course work on a "Credit/No Credit" basis, and will receive a grade of "Credit"

if the course is satisfactorily completed with a grade of 65 or better. No student may change from a numerical grade to a "Credit/No Credit" basis in a course during the last four weeks of classes except with the permission of the instructor. An unexcused failure to take an examination in a course or failure to submit a required research paper will result in the recording of a grade of 45 for a course taken on a "Credit/No Credit" basis.

No student may take more than 17 semester hours of courses (including Law 220 and also courses regularly given on a "Credit/No Credit" basis) on a "Credit/No Credit" basis.

Students are advised to consider carefully the advisability of electing to take courses on a "Credit/No Credit" basis. In the opinion of the faculty, a student's election to take courses on a "Credit/No Credit" basis may, in view of the importance apparently attached to grades by educational institutions and employers, be detrimental to the student's career in the legal profession.

GRADES

Grades are given in numerical terms equivalent to letter grades as follows: 85–100, *A*, Excellent; 75–84, *B*, Good; 65–74, *C*, Satisfactory; 55–64, *D*, Poor —below standard for graduation: 45–54, *F*, Failure. In Law courses 220, 321–22, 323, 342, 343, 345, 346, 385, 399, 459, 479, 509, 579, and 593 grades are *CR*, Credit (minimum grade of 65 required); *NC*, No Credit. A student who has been excused from taking a regularly scheduled examination is given the grade of *I*, Incomplete. See "Examinations" (page 40) for grade upon failure to take an examination. Grades between 55 and 100 indicate that the work has been completed and credit given. Grades between 55 and 64, however, do not represent satisfactory work and adversely affect a student's cumulative average. No credit is given to J.D. candidates for grades below 55 or to post-J.D. candidates for grades below 65. No grade may be changed by an instructor after it has been posted in the law school or disclosed to a student unless there has been an error in arithmetic certified in writing as such by the instructor.

Any student who receives a grade below 55 (*F*) has the right to retake the course once, from the same or a different instructor, but only within the next academic year. (This does not apply to post-J.D. students.) The grade received in the retaken course shall be entered into the student's record in addition to the original grade, and both grades shall be included in computing the student's average. A student may exercise the right to retake a course only with respect to two different courses during study at the Law Center.

The cumulative average of a student includes all grades in all courses taken while a candidate for a particular degree. When a course is repeated (see "Academic Dishonesty," page 43), both the first grade and the subsequent grade or grades are counted in the cumulative average.

EXCLUSION AND PROBATION FOR POOR SCHOLARSHIP

Candidates for the Degree of Juris Doctor.—A student whose cumulative average at the end of any semester falls below 65.0 but is above 64.0 will be put on probation. If such a student fails to raise the cumulative average to

65.0 at the end of the next semester, the student will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee.

A student whose cumulative average at the end of any semester falls below 64.0 will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee to register.

A student who fails more than one course over the entire period of law study will not be permitted to register for any succeeding semester or to graduate unless the student petitions for and receives the permission of the Scholarship Committee.

A student who is not permitted to register under the foregoing provisions will be excluded as of the beginning of the semester for which the student was ineligible to register.

Students who are registered at the time they receive notice that they will not be permitted to register for the next semester are entitled to withdraw from school and to receive a full refund of the tuition paid for the semester, or to complete the work for which they are registered.

Any student excluded may petition for reinstatement; if the student can demonstrate that the low grades were due to circumstances beyond the student's control and that the student has the capacity to pursue the study of law with a definite likelihood of success, that student may be readmitted subject to such conditions as may be imposed by the Scholarship Committee.

Despite the above provisions, a student will be allowed to complete the first two semesters of law study before being denied permission to register for a succeeding semester.

For this purpose the term "semester" includes a session of the summer term.

Candidates for Masters' and Doctoral Degrees.—A candidate for a master's or doctoral degree whose work is not satisfactory in the opinion of the faculty, taking into consideration the requirements and standards for the degree, may, by action of the faculty, be excluded at the end of the semester for which the candidate is currently registered.

A cumulative average of 78 (see page 20) is required for the Master of Laws degree and a cumulative average of 65 (see page 25) for the Master of Comparative Law degrees. A student whose cumulative average falls below the required minimum at any time will be ineligible for continuation in the program without the permission of the Dean. Such a student will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Dean or the Board for Graduate Studies.

Unclassified Students.—An unclassified student whose work is not satisfactory may be excluded at the end of the semester for which the student is currently registered.

SUMMER SCHOOL CREDIT

Students planning to attend summer school sessions at other law schools and desiring to use credits obtained at such schools in their Juris Doctor program at this Center must first have the courses they wish to take approved by the Dean. Students may not take courses in summer sessions at other law schools in this vicinity if these same courses are being given during the Summer Ses-

sions at the National Law Center. In no event will credits be given for unsatisfactory work or be recognized in excess of those which might be obtained in a similar period in this program.

TRANSCRIPTS OF RECORD

Official transcripts of student records will be issued on request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript.

CONTINUOUS REGISTRATION

Degree candidates are expected to maintain continuous registration until *all* degree requirements are satisfied. By failing to register for one semester or more, the student breaks his registration and must be readmitted (see "Readmission," page 29). A "Readmitted Student" is required to satisfy the curriculum requirements existing at the time of his readmission. Post-J.D. students who have completed course requirements may maintain continuous registration by paying the "continuous registration" fee (see page 32); *J.D. degree candidates may not maintain continuous registration by paying the "continuous registration" fee.*

GRADUATION REQUIREMENTS

Diplomas are awarded in February, May, and September.

To be recommended by the Faculty for graduation, a student must have met the admission requirements of the National Law Center; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which the student is registered; and be free from all indebtedness to the University. Registration, either for course work or on the "continuous registration" fee basis, is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation.—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

ACADEMIC DISHONESTY

The University community, to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of,

all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper university channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

MILITARY LEAVE

A student called to active duty may be granted military leave for the period of active duty, upon presentation to the Dean of a copy of the military orders and a petition for such leave. The maintenance of "continuous registration" is not required of the student on military leave; however, the student must apply for readmission to the University well in advance of the semester of expected return. Payments for tuition and fees which are not refunded to the student at the time military leave is granted will be maintained as a deferred credit for the student's account and use upon return to the University.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: address; telephone number; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; and honors received. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

University guidelines on the release of student information may be obtained from the Office of the Registrar.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO DISMISS STUDENTS

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled and the student will be ineligible (except by special action of the Faculty) for subsequent registration.

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A "Lost and Found" Office is maintained on campus in the Safety and Security Office.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.



Center for Academic and Administrative Computing

Director F. William Rambo

THE CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other operational supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week to all qualified faculty, staff, and students.

The Center provides computational facilities, conducts seminars, consults with users, and provides operational assistance as required. The central processing unit is an IBM 370/148, with card-reading capability, on-line disc storage, six tape units, two printers, and remote entry device for quick turnaround. The operating system is an OS/VS 1 with most of the commonly used compilers and a large library of programs.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

RESIDENCE HALLS

For the fall of 1977, the University will be able to provide limited regular residence hall space for graduate students. However, the Housing Office operates an Off-Campus Housing Resource Center, and attempts to provide information and assistance for those seeking accommodations. For complete information on this service, as well as apartment guides and referrals, interested applicants should contact Director of Housing, George Washington University, Washington, D.C. 20052.

FOOD SERVICE

Contract food service is available from August to May, and is based on the undergraduate academic calendar of registration, exams, and vacation periods. Alternative accommodations for the law school calendar are made. The rate for the seven-day, 19 meals per week plan has been set at $830. The 14 meals per week plan has been set at $780, and the 10 meals per week plan at $652. Contract service is cafeteria style and provided in two residence halls and the Cloyd Heck Marvin Center.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board; the departments of Drama, Dance, and Music; and other student and faculty organizations.

The Center Governing Board, representing varied segments of the University community, plays an important role in the day-to-day functioning of the Center. This Board works closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

Director Naomi Schaub, M.D.

The Student Health Service is an outpatient clinic located in the H.B. Burns Memorial Building at 935 22nd St., N.W.

Physicians and physician assistants are available by appointment from 9 a.m. to 4:45 p.m., Monday through Friday. In addition, physician assistants are available for primary care to walk-in patients Monday through Friday from 5 to 6:45 p.m., on Saturday from 9 a.m. to noon, and on Sunday from 10 a.m. to noon.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The Student Health Service Office has arranged for and endorsed group health and accident insurance, on an elective basis, for those *full-time* students who do not have other coverage. Interested students should contact the Student Health Service Office.

STUDENT EMPLOYMENT

The Law Center helps in the placement of its students and maintains a placement service for that purpose. In addition, the Student and Alumni Career Services Office, Woodhull House, 2033 G Street, N.W., provides assistance to students seeking full-time, part-time, or temporary employment. This Office maintains a registry of positions available and refers qualified applicants for consideration. Information is also available on Civil Service examinations.

A student taking more than 10 semester hours must limit outside employment to less than 20 hours (see "Academic Work Load," page 39). It is urged that full-time students refrain from engaging in outside employment during their first year. Although work in some special areas may contribute to the learning and experience of the student, as a general rule it will compete with time needed for adequate study and preparation, which are at the heart of a good legal education.

PLACEMENT SERVICE

The Law Center takes a continuing interest in the placement of its graduates in private practice and governmental service as well as with industry and commerce. The Dean, the Faculty, and the Placement Office cooperate in collecting information from alumni, law firms, and government agencies concerning opportunities in legal positions throughout the country. Senior law students and recent graduates are urged to keep in touch with the Placement Office.

VETERANS EDUCATION

The veterans counselor in the Office of the Registrar, Luther Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as veterans, widows, or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration, and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.



COURSES OF INSTRUCTION

THE COURSES OF INSTRUCTION listed below are subject to change. The University reserves the right to withdraw any course announced.

The number of hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. Thus, a year course giving two hours of credit each semester is marked (2–2), and a semester course giving two hours of credit is marked (2).

In most courses, a final examination is held during the examination period, and the grade in the course is determined in large part by that examination. These courses are parenthetically marked "Examination."

Courses that require the preparation of a major research paper in lieu of an examination are parenthetically marked "Research Paper." The satisfactory completion of such a paper by a student individually will satisfy the Legal Writing curriculum requirement for the J.D. degree.

Courses parenthetically marked "Problem Assignments," "Writing Assignments," "Take-home Examination," "Choice of Paper or Examination," or "Clinical Work" indicate the nature of the method planned by the instructor for determining in major part the grade to be given for the course. A course marked with any of these designations will not satisfy the Legal Writing curriculum requirement for the J.D. degree.

Day classes begin at 9:10 a.m. and run throughout the entire morning and afternoon. Evening classes begin at 5:50 p.m. Many examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be held in the evening.

A parenthetical designation at the end of a course description indicates whether the course is scheduled to be offered in the spring or fall semester or in the summer sessions, and also usually whether it will meet in the day or evening. When a double-numbered course is designated "Academic year," the first half of the course is scheduled to be offered in the fall, the second half in the spring. Courses with no parenthetical designation indicating time of offering are not scheduled to be given during the 1977 summer sessions or the 1977–78 academic year.

Courses for Juris Doctor Candidates

Required courses are numbered from 201 to 300. Courses numbered from 301 to 400 are normally taken by second- and third-year students. Courses numbered from 401 to 600 are generally more advanced. Second-year students

may take courses numbered above 400 only with the permission of the Dean. Third-year students are encouraged to take one course numbered above 400 each semester, and may take more than one such course with the permission of the Dean.

The following courses are among those offering clinical work: Law 343, 345, 346, 394, 396, 399, 458, 459, 479, 508, 509, 579.

REQUIRED COURSES

203–4 **Contracts I–II** (4–2) Nash, Cibinic, Pock, Ginsburg, Caplan

Legal remedies of contracting parties, including damages in contract and quasi-contract, specific performance, reformation, rescission, remedies in tort; acts creating and terminating contractual rights, including offer and acceptance, mistake, problems of proof; function of consideration; conditions; assignments; third-party beneficiaries; effect of changed circumstances; protection of the client's interests upon breach or threat of breach by the other party. Emphasis on problems of analysis, draftsmanship, adversary method. (Examination) (Academic year—day and evening)

207 **Torts** (4) Seidelson, Park, Banzhaf, Schwartz, Sirulnik

Liability for harm to person or property. Intentional torts, negligence, nuisance, products liability, misrepresentation, defamation, and invasion of privacy; fault and other basis for shifting losses; causation; damages; effects of liability insurance; problems under Federal Tort Claims Act. (Examination) (Fall—day and evening)

211 **Property** (4) Starrs, Schiller, Brown, Reitze, Chandler

Basic concepts of personal property. Real property: historical background of the law of estates and conveyancing, types of estates, dower and curtesy, landlord and tenant relationship, concurrent estates, future interests at common law and after the Statute of Uses; introduction to modern conveyancing—the real estate contract, the deed, the recording system, methods of title assurance. (Examination) (Fall—evening; spring—day; summer 1977)

212 **Constitutional Law** (4) Miller, H. Green, Mayo, Barron, Park

Basic principles of American constitutionalism; judicial function in constitutional cases; implementation of doctrines of separation of powers, federalism, limited government; development and exercise of national powers; introduction to civil rights and liberties. (Examination) (Spring—day and evening)

215 **Criminal Law and Procedure** (4) Starrs, Robinson, Zenoff, Sirulnik, Caplan

Origin and purposes of criminal law; elements of criminal liability; mental disorders; crimes against the person, property, and against both; statutory offenses; criminal procedure, with consideration of Federal Rules of Criminal Procedure. (Examination) (Fall—day; spring—evening)

218 **Civil Procedure** (4) Sharpe, Schwartz, Park, Kayton, Barron, Smalls

Mechanics of litigation—rules which govern the process by which rights and duties studied in substantive law courses are enforced; pleadings, discovery, pre- and post-trial motions, jurisdiction and venue, equity jurisdic-

tion and trial by jury, former adjudication. Emphasis on Federal Rules of Civil Procedure, but principles and main problems indigenous to al procedural systems are developed. (Examination) (Spring—day and evening)

220 **Legal Research, Writing, and Professional Responsibility and Ethics** (2) Seidelson and Staff

Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of professional responsibility and ethics. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. For credit, a student must attain a minimum grade of 65. **(Fall—day and evening)**

232 **Evidence** (4) Seidelson, Robinson, Albert, Park

Preparation and presentation of evidence, including proof of writings; qualification and examination of witnesses with emphasis on impeachment; privilege; opinion testimony; determination of relevancy; demonstrative, experimental, scientific evidence; application of the hearsay rule. (Examination) (Spring—day and evening; summer 1977)

ELECTIVE COURSES

302 **Admiralty** (2) Sharpe

American practice and jurisdiction in admiralty; saving clause actions at law. Substantive maritime law of title and possession, maritime liens, personal injury and wrongful death, charter parties and bills of lading, general average and salvage and marine insurance, collisions. Lawmaking methods: judge-made law, statutes, international commercial custom, and treaties. (Examination) (Spring—day)

303 **International Law and World Order** (3) Mallison

(Formerly Law 305)

An introduction to international law which provides the background for the study of specialized seminars; emphasis on national states as participants in decision-making processes with consideration also of individuals; analysis of range of available sanctions; roles and effects of international agreements under United States Constitution; introductory study of the World Bank. Complements but does not repeat material in Law 304. (Examination) (Fall—day and evening, summer 1977)

304 **United Nations Law and World Order** (2) Mallison

Introduction to international law through study of law and practice of United Nations Charter; structure and process of decision of United Nations; maintenance of international peace and security—peaceful settlement of disputes and national and collective self-defense; including current problems considered by the United Nations. Complements but does not repeat the material in Law 303. (Examination) (Spring—day and evening)

307 **Comparative Law** (3) Albert, Liebesny

A general introduction to the world's main legal systems with emphasis on civil law. Comparative study of the administration of justice, procedural problems, and selected substantive legal institutions. (Examination) (Spring—day)

309 **Conflicts of Laws** (3) Seidelson, Pock, D. Green, Smalls

Legal problems arising from occurrences transcending state or national boundaries; jurisdiction; foreign judgments; constitutional influences; theoretical bases of choice of law principles and their application to specific fields, including torts, contracts, property, family law, administration of estates, business associations. The grade *CR* (credit) or *NC* (no credit) only is given in sections taught by D. Green. Green (Problem Assignments) Seidelson, Pock (Examination) (Fall—evening; spring—day; summer 1977)

311 **Agency and Partnerships** (2) Sharpe, Schiller

Employment relations, vicarious liability of employers for employees' torts, scope of employment, and independent contractors; agents' authority and apparent authority to contract for their principals, ratification; nonprofit associations; the formation, operation, and termination of partnerships; limited partnerships. (Examination) (Fall—day and evening)

312 **Corporations** (4) Kirkpatrick, H. Green, Stevenson, Fielding, Solomon, Park

Corporate law, with emphasis on operations and financing of corporations. Control of corporations, action by corporate directors, officers, shareholders. Control devices. Directors' and shareholders' duties of care and loyalty, insiders' transactions in shares of the corporation. Derivative suits, kinds of shares, dividends, corporate distributions. (Examination) (Fall—day and evening)

313 **Sales and Sales Financing** (2) Albert, Rothschild, Ginsburg

Provisions of the Uniform Commercial Code relating to sale and distribution of goods, including bulk transfers, warehouse receipts, bills of lading, and other documents of title; particular attention to secured transactions and financing devices utilized in this connection. (Examination) (Fall—day and evening)

314 **Commercial Paper, Check Collection, and Banking** (2) Albert, Rothschild, Schwartz, Ginsburg

Classic view of negotiable instruments as codified by Article III of the Uniform Commercial Code. Check collection: the system in theory as expressed in Article IV of the Uniform Commercial Code and the system in practice; Federal Reserve regulations, Clearing House agreements, and automation systems. The dual banking system, work of the Comptroller General and the Federal Reserve Board. Legal problems concerning interest and the checkless society. (Examination) (Spring—day and evening; summer 1977)

318 **Creditors' Rights** (3) Kirkpatrick, Fielding

Creditors' remedies outside bankruptcy—compositions, agreements, general assignments; bankruptcy proceedings under the federal statute, administration, discharge, the position and powers of the trustee, preferences; corporate reorganization under Chapter X of the Bankruptcy Act. (Examination) (Fall—day; spring—evening)

321-22 **Current Decisions** (2–2)

Limited to members of the student staff of the *Law Review*. A maximum of 4 semester hours of credit may be earned in this course. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Academic year—day and evening)

323 **Journal of International Law** (1 or 2)

Limited to editors of the student staff of the *Journal of International Law and Economics*. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged)

325–26 **Trusts and Estates I–II** (3–3 Weaver, Chandler, Solomon

Noncommercial transfers of wealth at death or during life. Law 325: essential elements and formalities for creation of trusts and execution of wills, revocation and alteration, grounds for contest, limits on property owner's power to control, intestate succession. Law 326: dispositive provisions, common questions of construction, future interests problems, administration of estates and trusts, charitable trusts. Prerequisite to Law 325: Law 211; to Law 326: Law 325. (Examination and Problem Assignments) (Law 325: fall—day and evening; spring—day; Law 326: spring—day and evening)

327 **Modern Real Estate Transactions** (2) Brown, Schiller

Advanced problems in purchase and sale of real estate: legal responsibility and functions of buyer, seller, broker, escrow agent, conveyancing attorney, title examiner, abstractor, insuror of title; process of examination and assurance of title and other interests in realty, including recording, registration and title insurance systems, settlements and closings, warranties, hazard insurance; emerging problems related to cooperatives, condominiums and property-owners' associations; problems related to compliance with subdivision, zoning, building and housing code regulations. (Examination) (Spring—day)

329 **Unfair Trade Practices** (3) Weston, Banzhaf, Schwartz

Unfair trade practices at common law and under statutes; trademarks, trade names; copyright law; misappropriation of ideas; protection of competitors and consumers against false advertising under Federal Trade Commission Act; resale price maintenance under state Fair Trade Acts, state sales-below-cost statutes; Robinson-Patman Price Discrimination Act, miscellaneous business practices. (Examination) (Fall—day and evening)

330 **Federal Antitrust Laws** (3) Weston, Kirkpatrick

Sherman and Clayton Acts, related statutes. Price-fixing agreements and other types of trade restraints considered under Section 1; monopolizing considered under Section 2 of the Sherman Act. Mergers and tie-in sales, other activities under the Clayton Act. All types of business conduct raising questions under the antitrust laws, including trade association activities, exclusive-dealing arrangements, boycotts, patents and copyrights. (Examination) (Spring—day and evening)

331 **Product Liability** (2) Schwartz

Development of the concept of product liability and consumer's remedies. Specific problems and processes in evaluation of risk and benefit encountered in government regulation of dangerous and defective products. Survey of civil actions for harm resulting from defective and dangerous products with reference to parties and proof in negligence, warranty, nuisance, fraud, misrepresentation, and other cases. Problems associated with hazard identification, insurance, and industry self-regulation. Review of Consumer Product Safety Act and current legislation dealing with injuries and remedies in specific areas. (Choice of Research Paper or Examination) (Spring—day)

332 **Federal Jurisdiction (2)** Albert, D. Green, Barron, Smalls, Kayton

Relationship of federal courts to Congress and to the states, through analysis of cases dealing with federal judicial functions (including problems of advisory opinions, standing to litigate, justiciability), federal questions in federal courts, federal review of state court decisions (including relation between state and federal substantive law, procedural problems in exercising review, application of law to fact). The grade *CR* (credit) or *NC* (no credit) only is given in sections taught by D. Green. Albert—(Examination); Green—(Problem Assignments) (Fall—day and evening)

334 **Advanced Criminal Procedure** (2) Starrs, Robinson, Zenoff

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Starrs—(Examination and Problem Assignments); Robinson, Zenoff—(Examination) (Fall—day and evening)

335 **Jurisprudence** (2) Mayo, Kramer, Park

Basic jurisprudential concepts; nature of law; development of legal institutions; jurisprudential schools—natural law, analytical, historical, sociological, functional; law and logic; law and justice; the judicial process; legislative, executive, administrative decision-making; impact of politics, economics, and scientific advance on legal systems; contemporary trends in jurisprudential thought. Mayo—(Examination); Kramer—(Writing Assignments) (Fall—evening; spring—day; summer 1977)

336 **Taxation—Federal Income** (3) Weaver, Hambrick, Fielding, Solomon

Survey of substantive provisions of federal income tax law, including concept of gross income, provisions affecting taxation of family and individual transactions, limitations on allowable deductions, sales and dispositions of property, problems of capital gains taxation, nontaxable exchanges. Weaver—(Examination and Problem Assignments); Hambrick—(Examination) (Fall—day; spring—day and evening; summer 1977)

338 **Taxation—Federal Estate and Gift** (2) Kramer, Hambrick, Weaver

Survey of substantive provisions of federal estate and gift tax laws, including inter vivos transfers, transfers in contemplation of death, joint interests, life insurance proceeds, property subject to powers of appointment, marital deduction and split gifts; tax procedure. (Examination) (Fall—day; spring—evening)

339 **Collective Bargaining and Labor Arbitration** (3) Merrifield, Rothschild

Collective labor agreement: content, negotiation, administration through grievance procedure and arbitration; problems in settlement of labor disputes. Prerequisite: Law 341. Merrifield—(Examination and Problem Assignments); Rothschild — (Problem Assignments) (Spring — day and evening)

340 **Taxation—Federal Income, Corporations and Shareholders** (3) Hambrick, Fielding, Solomon

Continuation of Law 336. Primary emphasis on corporate-shareholder relationships. Problems of corporate dividends, redemptions of stock, distributions in partial and complete liquidation, stock dividends, bail-outs, and dividends in kind closely analyzed. Federal income tax problems

involved in the formation of corporations, the sale of corporate businesses (including collapsible corporations), mergers and acquisitions, and corporate divisions. Students who have received credit for former Law 337 cannot receive credit for Law 340. Prerequisite: Law 336. (Examination) (Fall—evening; spring—day)

341 **Labor Law** (3) Merrifield, Albert, Rothschild

Law governing labor-management relations, organizations and representation of employees, regulation of economic weapons, enforcement of collective bargaining agreements, interunion and intra-union relations. (Examination) (Fall—day and evening; summer 1977)

342 **Moot Court** (1 or 2)

Satisfactory participation in the upperclass competition results in one hour of academic credit. Finalists in the upperclass competition receive two hours of academic credit. Finalists in the first-year competition receive one hour of academic credit. No academic credit is awarded to nonfinalists in the first-year competition. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

343 **Law Students Civil Rights Research Council (LSCRRC)** (1 or 2) Sirulnik

Clinical problems concerned with the legal problems of minorities, women, and the poor. Students work with organizations such as the Lawyers Committee for Civil Rights Under Law, Women's Legal Defense Fund, Civil Rights Division of the Justice Department, Institute for the Development of Indian Law, National Committee Against Discrimination in Housing, and National Senior Citizens Law Center. Approximately 60 hours of work per semester is required for each credit hour. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer—as arranged)

344 **Legal Writing** (1 or 2) Staff

Preparation of a research paper under the supervision of a full-time member of the Faculty who will determine, prior to registration, whether the work required for the topic selected justifies one or two semester hours of credit. If elected for one hour of credit, this course may be repeated to meet the legal writing requirement for the degree. Approval of the faculty member is required prior to registration. (Research Paper) (Fall and spring—as arranged; summer 1977)

345 **Students-in-Court** (4) Zeneff

Open only to third-year law students. In the D.C. Law Students in Court Program, students represent indigent litigents in the Small Claims, Landlord-Tenant, and Criminal (misdemeanors) division of the D.C. Superior Court. Their duties include client interviews, investigation, settlement negotiations, preparation and argument of motions, and conduct of trials. Students are required to spend one day in court and attend seminars each week (Wednesday or Thursday evening at the student's option in the civil program; Monday evening and Saturday morning in the criminal program). Some seminars will be held off campus. Application must be made during the spring semester of the preceding academic year; preference will be given to students with a cumulative-grade average above [illegible]; however, consideration is given to past participation in clinical or extracurricular activities or employment which provides background for litigation and working with indigents. Students may participate during the summer, during the full academic year, or during the summer plus one other

semester. This course may not be taken at the same time as Law 579, or any litigating activities in Law 346. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged; summer 1977)

346 **Legal Aid** (arr.) **Staff**

Work done in connection with the Legal Aid Bureau under the supervision of the faculty adviser, who will determine, prior to registration, the number of semester hours of credit the work required will justify and whether the student has all prerequisites. Any litigating activities of this course may not be taken at the same time as Law 345, or 579. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged)

347 **Insurance** (2) **Schiller, Pock**

A primary risk-distributing medium and the rules by which legislative, administrative, and judicial bodies seek to promote its benefits and avert its dangers. Includes insurance marketing, insurable interest, subrogation, transfer of insurance benefits to nonpolicyholders, coverage and other insurance policy provisions, disposition of claims. (Examination) (Fall—day and evening; summer 1977)

348 **Domestic Relations** (2) **Potts, Zenoff**

Marriage, annulment, and divorce; adoption and custody of children; economic relations. (Examination) (Fall—evening; spring—day)

349 **Local Government Law** (2) **Pinsky**

Decision-making processes in metropolitan and local communities; types and objectives of city, county, and special-function local government units; intergovernmental relations; original organization and changes; personnel; local lawmaking; responsibility in tort; introduction to community planning. (Examination) (Spring—evening)

351 **Law and Accounting** (2) Cibinic, Ginsburg, Herman

Study of fundamental accounting principles with emphasis on corporation accounting; legal and accounting implications of specific items in financial statements of corporations; inventory adjustments; corporate transactions, distributions, capital adjustments. Strongly recommended for students who have had no accounting. (Examination and Problem Assignments) (Fall—evening; spring—day)

355 **Government Contracts** (3) **Nash, Cibinic**

Survey of basic law underlying government procurement, basic power and limitations on federal government in entering into contracts, administrative and legislative policies governing these contracts, advertised and negotiated procurement procedures, forms of contracts and clauses used. Law 431 *Government Procurement Law* is the substantial equivalent of this course. (Examination and Problem Assignments) (Spring—day)

359 **Patent Law** (3) **Kayton**

Law of patents subsequent to issuance of patent; nature of patent as property and as a legal instrument; validity—novelty, nonobviousness, commercial success; infringement—direct and contributory, doctrine of equivalents and file-wrapper estoppel. Substantive concepts introduced in an

order approximating patentee's and infringer's cases in litigation. Designed for students intending to specialize in patent law; knowledge or experience in patent law helpful but not prerequisite. (Examination) (Fall—evening)

362 Patent Office Practice (2) Kayton

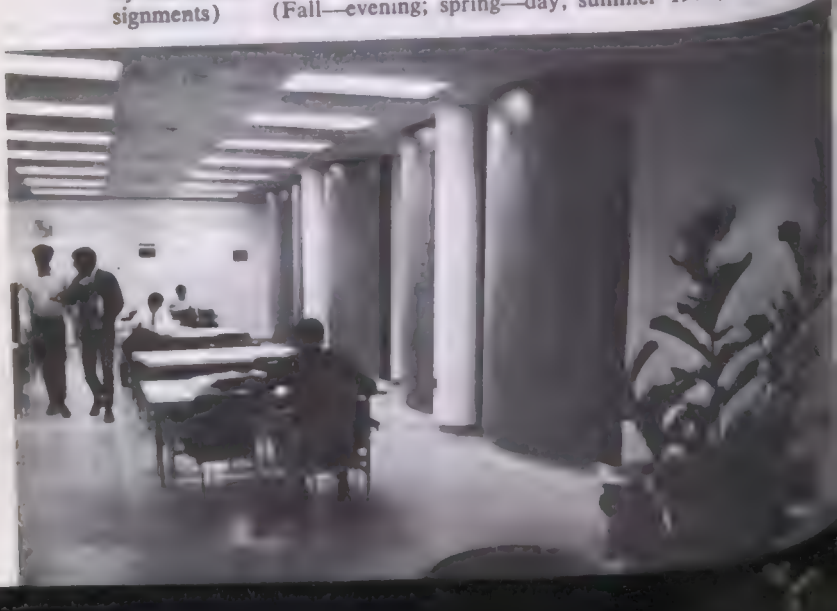
Substantive and procedural law of patents leading to issuance of patent, mainly related to proceedings before U.S. Patent Office. Obtaining and preserving earliest possible patent filing date; continuing applications, res judicata, novelty and nonobviousness requirements; substantive rules of priority of invention and related affidavit practice; nature of claims and formal defects; restriction and double patenting. Designed for students intending to specialize in patent law. Prerequisite: Law 359. (Examination) (Spring—evening)

372 Administrative Law (3) Miller, Park, Banzhaf, Barron

Study of the administrative process in executive and independent regulatory agencies; emphasis on judicial review. Formal and informal decision-making, investigation, planning, and public administration functions of the agencies as related to their legal limits and to the roles of lawyers in government and private practice. Relationships of agencies to the executive and legislative branches, to public and private interest groups, and to the social, political, and economic aspects of various philosophies of government regulation. Miller—(Research Paper); Park—(Examination and Writing Assignments); Banzhaf—(Examination) (Fall—day; spring—evening; summer 1977)

375 Remedies (3) Cibinic, Ginsburg, Nash, D. Green, Smaltz

Development and use of judicial remedies that give relief for past or threatened injuries to interests of personalty and property. Remedial approaches include compensatory and punitive damages, injunctions, unjust enrichment, constructive trusts, equitable liens, tracing, subrogation, and specific reparation. Emphasis on comparing remedial options in fraud, mistake, duress, breach of contract, and abuse of fiduciary relationships. The grade *CR* (credit) or *NC* (no credit) only is given in sections taught by D. Green. Cibinic, Ginsburg—(Examination); Green—(Problem Assignments) (Fall—evening; spring—day; summer 1977)



377 Legislation (2) **Ferster**

Legislative process and roles of participants in the process; operation of United States Congress and state legislatures, including fact finding, organization, procedure. Statutory interpretations emphasized to provide foundation for more advanced courses. (Examination)

380 Environmental Law (3) **Reitze**

Government control of environmental pollution; the National Environmental Policy Act; solid waste management; noise, water, and air pollution control; and common law remedies. (Examination) (Fall—day and evening)

381 Environmental Planning (3) **Reitze**

Survey of the law of environmental planning, including selected topics of land use planning, mining, forestry, energy, transportation, public land law, and ocean protection. (Examination) (Spring—day)

385 Trial Practice Court (2) Jackson, Ryan, Kendrick, Skinker, **Stevas, Altshuler, Nunzio, Seidel**

Trial of assigned cases, trial techniques, pre-trial and courtroom procedures pursuant to federal rules. Students may repeat this course once for credit. Prerequisite: forty-two semester hours, including Law 218. Prerequisite or concurrent registration: Law 232. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and Spring—day and evening)

389 Medicine for Lawyers (2) **Hirsh**

Survey of the basic medical sciences and the rudiments of clinical medicine as encountered in the practice of law. Medical terminology, the disease process, trauma, and industrial medicine. The application of this fundamental information is demonstrated in personal injury or negligence and malpractice litigation as well as in commitment and equitable proceedings. Students may witness autopsies at the D.C. Medical Examiner's Office, surgery at George Washington University Hospital, and medical rounds at D.C. General Hospital. Emphasis on enabling the lawyer to communicate most effectively with medical specialists. (Examination) (Fall—day)

390 Forensic Medicine (2) Sharpe, Fiscina, Head

Malpractice, insurance, and alternatives to professional liability litigation; securing and presenting medical evidence to prove causation and damages; chemical test data and behavioral science findings in court; entry into and practice of the professions; professional organizations; hospitals; professional service delivery; public policy intervention in medical science—for example, abortion, transplantation, and coerced treatment. (Examination) (Fall—day and evening)

394 Women and the Law (2) **Dorian**

An examination of the treatment of women in all areas of the law and of legal remedies for sex discrimination. Emphasis on constitutional law, criminal law, discrimination in the media, education, and employment. Students choose clinical projects or research papers on which to focus the semester's work. Enrollment limited to 30 students. (Research Paper) (Spring—evening)

396 **Legal Activism** (3) Banzhaf
Study of the use of law and the legal process, not as a technique for re-
solving disputes between identified individuals and/or organizations, bu
as a powerful tool for ameliorating problems of general public interest
Principles and techniques of legal activism, maximum effectiveness of pub-
lic interest actions, how these actions differ from conventional legal prac
tice. To learn these techniques effectively, and to test and develop their
proficiency in their use, students will form clinical project groups and
initiate or participate in a legal or law-related activity directed against a
public interest problem of their own choosing. (Fall—day)

398 **National Center for Law and the Deaf Clinical Education Activities** (1, 2, or 3) Banzhaf
Work with the National Center for Law and the Deaf/Hearing Im-
paired in bringing legal information, services, and representation to the
more than 13 million Americans who are deaf or hearing impaired.
The Center, a joint program of the National Law Center and the Gal-
laudet College, is designed to help make the hearing impaired aware of
their legal rights and to assist them in solving their legal and law-re-
lated problems. Students may participate in one or more projects: (1)
counseling persons with hearing impairments about legal problems at a
walk-in clinic usually held on the Gallaudet College campus; (2) pre-
paring and participating in workshops for hearing-impaired persons to
acquaint them with their rights and obligations under the law; (3) as-
sisting in representing the interests of deaf and hearing-impaired persons
in judicial and administrative proceedings; (4) preparing research papers
on topics related to law and the deaf, or preparinig handbooks explain-
ing legal topics to the hearing-impaired. Students may learn some sign
language, but will be assisted by trained translators when dealing with
deaf individuals. Approximately 60 hours of work per semester is
required for each credit hour. Students may repeat this course for a
maximum of eight semester hours of credit. This course may not be
taken at the same time as Law 345, or any litigating activities in Law 346.
The grade of *CR* (Credit) or *NC* (No Credit) is given for this course.
(Fall, spring, summer—as arranged)

399 **Clinical Law Work** (arr.) Staff
Projects involving litigation, research, or public interest activities of a
legal nature (including aid to indigents, support of public interest non-
profit corporations, and support of governmental agencies or courts) may
be initiated and will be supervised by a faculty member. Projects must be
approved in advance by the Law Center Supervisory Committee (three
members) both as to whether the project is appropriate and as to the
number of semester hours of credit to be granted. A maximum of two
semester hours of credit may be taken in one or two semesters. This
course is open to a limited number of third-year law students. The grade
CR (Credit) or *NC* (No Credit) is given for this course. (Fall and
spring)

Advanced Courses

ADMINISTRATIVE LAW: ECONOMIC REGULATION

Faculty Advisers: A.S. Miller, R.E. Park, G.E. Weston Miller

402 **Executive Function** (2)
Executive branch in constitutional theory; major trends in development of
executive-administrative function; organization of executive branch; rela

tionship of executive to Congress and judiciary; policy-making procedures within executive branch including role of Bureau of the Budget in national policy planning; case studies in exercise of executive power in such functional areas as national defense, race relations, national economy, foreign economic relations; role of law and lawyers in executive decisional and implemental process. (Research Paper) (Spring—day)

403 **Public Economic Policy and the Law** (2) Peterson

Interrelation of law and economics in such subject-matter categories and decisional contexts as economic regulation of industry, fiscal policy planning, government research and development practices, foreign trade and investment, and public spending priorities. (Research Paper) (Spring—evening)

404 **Securities Regulation** (2) H. Green, M. Cohen, Mathews, Michaely

State and federal laws governing offering and distribution of securities to the public by corporate issuers and others, regulation of securities markets, rights and liabilities of purchasers under such statutes. Emphasis on statutes administered by Securities and Exchange Commission. (Take-home Examination) (Fall—evening; spring—day)

405 **Regulation of Securities Markets** (2) Pitt, Sonde

Operation of over-the-counter and exchange markets, including competitive and monopolistic practices in each market; relationship of antitrust laws and securities regulations to concept of a free and open market place; role of regional exchanges and third market in providing competitive element in market; advantages and disadvantages of a fragmented market; minimum fee structure, rebates and their effect on merchandising of securities and financial soundness of industry; use and availability of economic data in evaluating performance of market place. The seminar will examine matters directly of interest to graduate law students, lawyers, economists, and political scientists. (Take-home Examination) (Spring—evening)

411 **Administrative Practices and Procedures (Food and Drug Administration)** (2) Rothschild

The study of FDA administrative procedures for the purpose of investigating the significance that administrative practice has on regulatory activity. The course will consider FDA rulemaking procedures in general, a step-by-step consideration of the various hearing procedures now available under the new agency practices and procedures, and problems designed to enable the practical application of rulemaking and hearing procedures to achieve resolution. (Research Paper) (Fall—evening)

412 **Food and Drug Law** (2) Kaplan, Becker

The Federal Food, Drug, and Cosmetic Act, and related laws. Consumer, government, and industry viewpoints. (Choice of Research Paper or Examination) (Spring—evening)

413 **Public Policy and Mass Media** (2) Barron, Cohn

Institutional structure of mass media and their interrelationships; psychological aspects of mass communications; continuing adjustments among public interest goals, the economic system, and technological developments; influence of and controls exercised by government, other institutions, and private groups; conflict between freedom of speech of the media and other major community interests; the media's relationships to the interests of dissident and minority groups and the access of these

groups to the media. Barron—(Examination or Research Paper); Cohn—(Research Paper) (Fall—day; spring—evening)

414 **Regulated Industries** (2) Paris

Substantive problems of business regulation in terms of natural monopolies, licensed industries, subsidized industries, and safety regulation. Typical problems raised include the role of intervenors, the impact of regulation upon management and market behavior, the uses and abuses of economic evidence, the role of agencies' staffs, interagency planning and regulation, and the effects of judicial and legislative review. Each student selects one industry and develops an insight into economic regulation in terms of that industry's firms, market structure, growth and development, trade associations, and regulatory agencies. (Research Paper) (Spring—day)

417 **Seminar: Trade Regulation** (2) Weston

Group study of current problems relating to unfair trade practices and federal antitrust laws. (Research Paper) (Spring—evening)

Master of Laws candidates in the area of Administrative Law: Economic Regulation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
372 *Administrative Law*

Other Related Courses

451 *Federal Poverty Legislation*
494 *Use and Control of Nuclear Energy*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
571 *Land Development Planning*

CORPORATION LAW

Faculty Advisers: H.P. Green, R.B. Stevenson, Jr., R.F. Fielding, L.D. Solomon

422 **The Modern Corporation** (2) Miller

Analysis of the nature and role of the large business corporation in the American political economy; models of the corporation; the transnational or multinational enterprise; the concept of accountability as applied to corporate activities; reasons for the growth of large corporate enterprise; relationships of the "supercorporations" to other centers of decentralized power and to the government; the corporation as the basic planning unit of the American economy; application of the Constitution to the corporation. (Research Paper) (Fall—day)

424 **Business Planning** (2) H. Green, Stevenson, Flyer, Lewis, Berkeley

Integrated study of corporate, financial, tax, accounting, and SEC aspects of the following: organization of a small corporation; organization of a public corporation; stock dividends, recapitalization, and stock repurchase



in the context of conflict between active stockholders of a closed corporation and the family of a deceased active stockholder; corporate liquidations; corporate mergers and acquisitions; and divisions of corporations. Prerequisite: Law 312, 336, and 340. Enrollment may be limited by the professor. (Problem Assignments) (Fall and spring—day and evening)

426 **Introduction to International Economic Law** (2) Stevenson

Principles and processes of international law relevant to transnational economic transactions between private parties, including protection of aliens (individual and corporate) within national legal systems; protection by states of the economic interests of their nationals; act of state doctrine, expropriation, and the protection of alien-owned property; development of international law affecting transnational economic transactions through the decisions of national tribunals and through treaties and international agreements, adjudicatory jurisdiction of municipal tribunals and the enforcement of foreign judgments in the international context; international commercial arbitration; special problems of national and international regulation of transnational business transactions. Law 426 is recommended as a foundation for Law 427. (Examination)

427 **Legal Aspects of International Business Transactions** (2) Nurick, Stevenson

U.S. law and practice, including current tax problems and U.S. restrictions on investment; brief comparison with British and civil law systems; international law, international contracts, choice of law; currency considerations; effect of SEC laws and regulations; international trade, including GATT and reciprocal trade arrangements; sources of finance, both United States and foreign, private and public, including international organizations; protection of property, settlement of disputes, and selected case studies. In addition to the regular lecturers, there will be guest lecturers in various specialties. Emphasis on current problems in international trade and investment. (Choice of Research Paper or Examination) (Spring —evening)

Master of Laws candidates in the area of Corporation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

312 *Corporations*
313 *Sales and Sales Financing*
329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
340 *Taxation—Federal Income, Corporations and Shareholders*

Other Related Courses

331 *Product Liability*
417 *Seminar: Trade Regulation*
431 *Government Procurement Law*
525 *Copyright Law*
526 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*
540 *Choice of Law and Forum in Transnational Contracts, Techniques of Conflict Avoidance*
541 *Seminar: European Common Market*
555 *Taxation—Special Corporation Problems*
562 *Income Taxation of Foreign Business and Investment*

GOVERNMENT PROCUREMENT LAW

Faculty Advisers: J. Cibinic, Jr., G.J. Ginsburg, R.C. Nash, Jr.

431 **Government Procurement Law** (3) Nash, Cibinic

Survey of the law pertaining to government procurement, including an analysis of the unique features of government contracting and a discussion of the functions of Congress, the executive branch, and the courts in the procurement process. Law 355 *Government Contracts* is the substantive equivalent of this course. (Examination) (Fall—evening)

433 **Performance of Government Contracts** (3) Nash, Cibinic

Discussion of the substantive legal problems that most frequently arise during the performance of government contracts. Interpretation of specifications and the most generally used contract clauses, and analysis of the rights of the parties when performance in accordance with the terms of the contract is not obtained. (Examination and Problem Assignments) (Spring—evening)

434 **Government Contract Claims and Litigation** (2) Nash, Ginsburg

Analysis of the methods which can be used by the parties to a government contract to obtain legal relief, including detailed coverage of the disputes procedure, actions for breach of contract, and forms of equitable and extraordinary relief. (Examination and Problem Assignments) (Spring—evening)

435 **Seminar: Government Contracts** (2) Nash, Cibinic, Ginsburg

Research and discussion of selected problem areas. (Research Paper) (Spring—day)

Other Related Courses

402 *Executive Function*
424 *Business Planning*

427 *Legal Aspects of International Business Transactions*
442 *Labor Standards*
494 *Use and Control of Nuclear Energy*
495 *Legal Protection against Technological Hazards*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
535 *Negotiation: Concepts and Techniques*

LABOR LAW

Faculty Advisers: J.M. Albert, L.S. Merrifield, D.P. Rothschild

441 **Seminar: Disability Problems** (2) Johnson

Workman's compensation law, extension of no-fault principle into motor vehicle area, and national health problems. (Examination) (Fall—evening)

442 **Labor Standards** (2) Ginsburg

Analysis of the Fair Labor Standards Act, its scope and exemptions, the Civil Rights Act and other labor statutes; the laws establishing labor standards for government contracts, including the Davis-Bacon Act, Walsh-Healey Act, Service Contract Act, and Work Hours Act; the role of the Department of Labor, the Comptroller General, and the contracting agencies in interpretation, administration, and enforcement of these statutes. (Examination) (Spring—evening)

443 **Labor Relations in the Federal Service** (2) Tobias

Survey of labor relations in the federal service as governed by Executive Order 11491. Emphasis on the role of the Civil Service Commission, the Department of Labor, the Congress, and the President in the development of collective bargaining relationships between unions and the federal government. (Research Paper) (Fall—evening)

444 **The Individual and The Union** (2) Gold

Study of the legal relations between unions and their members with special emphasis on the right to fair representation, the right to union membership, compulsory union membership, the imposition of discipline upon union members, reporting requirements, the conduct of internal union elections, the fiduciary duties of union officers, the imposition of trusteeships, the regulation of racketeering, and political action of unions. Prerequisite: Law 341. (Examination) (Fall—evening)

445 **Labor Relations in State and Local Governments** (2)

Analysis of the shifting and emerging legal concepts that affect the form, scope, and consequences of labor relations in schools and colleges and in municipal, county, and state governmental bodies. Survey of the varied statutory and de facto labor relations systems and their impact on the development of bilateral decision-making. Examination of (1) problems caused by the concurrent existence of civil service laws and the diffusion of governmental authority, (2) impasse resolution, and (3) strikes and other concerted activities. (Problem Assignments)

446 **Equal Employment Opportunity** (2) Ginsburg, Hartman

This course covers the spectrum of federal laws and executive orders relating to all types of discrimination in employment, including Title VII of

the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972; the Equal Pay Act of 1963, as amended in 1972; the Age Discrimination in Employment Act; the Civil Rights Act of 1866; the Fourteenth Amendment; the National Labor Relations Act; Executive Orders 11246 and 11375 relating to government contractors (including the "Philadelphia Plan" and other government-imposed "affirmative action" plans and bid conditions, and Revised Order No. 4 relating to sex discrimination). The course includes the substantive and procedural rights available to employees of firms doing business with the government, as well as those of other private firms and state and local government agencies subject to the above federal legislation. (Examination) (Fall—evening)

447 **Seminar: Labor Law** (2) **Merrifield, Chanin**

Group study of contemporary problems of public sector labor law. (Research Paper) (Spring—evening)

449–50 **Seminar: Labor Litigation** (1–1) *Gold*

Intensive study of recent Supreme Court and appellate court decisions in the area of labor law; special emphasis on the contrasting variables which influence the respective decision-making processes of the National Labor Relations Board and the courts. Particular attention to labor law cases pending before the Supreme Court for decision during the current term. Analyses of the briefs filed in pending cases; attendance at oral argument; post mortems of the arguments and decisions, with classroom participation by attorneys involved in some cases. Grades and credit for both halves of the course assigned only on completion of the second half. Enrollment may be limited. Admission by permission of instructor. Prerequisite: Law 341. (Research Paper)

Master of Laws candidates in the area of Labor Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

339 *Collective Bargaining and Labor Arbitration*
341 *Labor Law*

Other Related Courses

459 *Problems of the Consumer*
460 *Current Problems in Civil Rights*

LAW AND POVERTY

Faculty Advisers: D.P. Rothschild, J.E. Starrs *Mirel*

451 **Federal Poverty Legislation** (2)

Students are given a chance to observe at first hand the problems inherent in implementing a federal policy to alleviate poverty through legislation. Students are assigned to work with individual poverty agencies in the District of Columbia on matters relating to the federal funding agencies. Discussions focus on various aspects of poverty law problems as lawyers deal with them—from conception of the legislative program, to Congressional debate, to administrative policies, to fund distribution, to litigation. (Research Paper) (Fall—day)

459 **Problems of the Consumer** (2 or 3) Rothschild

Clinical treatment of consumer protection. Minimum of 8 hours work commitment each week required; 2-hour weekly class required in addition for 3 credits. Students purchase consumer protection materials and text, and are divided into projects groups. For example, the National Law Center has negotiated with a commercial TV station to put on a series of news spots dramatizing consumer problems and also runs a "Consumer Help Center." This activity involves three groups: (1) a group to work with the station on programming, (2) a group to run the Consumer Help Center, and (3) a research group to investigate the results of complaint intake, referral, and disposition. Other students work in inner-city storefronts, with county government agencies, and on the editorial staff of the *Consumer Protection Reporting Service*. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—day; summer 1977)

460 **Current Problems in Civil Rights** (2) Robinson

Uses of law in the effort to achieve racial equality in areas such as (1) discrimination against minority groups and the poor in land use and zoning, (2) school desegregation, and (3) employment discrimination. The class is divided into groups, each dealing with a problem situation in one of these areas. Students represent fictitious clients, write briefs, and argue in class before a student panel of judges, which then writes an opinion. Grades are based on these written and oral presentations, plus brief critiques of other groups' presentations. Enrollment limited by the instructor. (Problem Assignments) (Fall—evening)

Other Related Courses

441 *Seminar: Disability Problems*
472 *Administration of Criminal Justice*
475 *Law and Criminology I: Search for the Causes of Criminal Behavior*
476 *Law and Criminology II: Society's Responses to the Criminal Offender*
560 *Taxation—State and Local*
571 *Land Development Planning*
575 *Community Economic Development*
592 *Seminar: Constitutional Law*

LAW, PSYCHIATRY, AND CRIMINOLOGY

Faculty Advisers: T.F. Courtless, Jr., E. Zenoff, G.M. Caplan

472 **Administration of Criminal Justice** (2) Caplan

Consideration and analysis of selected advanced problems in the administration of criminal justice. The subject matter covered will vary from year to year, with concentration in areas of current interest and dynamic change (e.g., right to counsel, arrest and interrogation, search and seizure, prejudicial publicity, discovery, electronic interception, mental impairment). Emphasis will be placed on the role and professional responsibilities of prosecutor and defense counsel and on developmental trends in the law. (Research Paper or Examination) (Spring—day)

473 **The Crime Lab, the Forensic Scientist, and the Criminal Lawyer** (2) Starrs

Designed to acquaint the student with the operations of a modern crime

laboratory and the courtroom acceptability of testimony of forensic scientists and other evidence on laboratory test results. Identification of individuals (fingerprints, palmprints, footprints, voiceprints, anthropological reconstruction, hair identification, and serology), identification of objects (ballistics, handwriting, typewriting, fiber identification, paints, varnishes, glass, wood, and paper), toxicology, pathology, forensic use of the microscope and the camera, the coroner and the medical examiner systems and drug law enforcement. Visual aids, crime laboratory guest lecturers and field trips to crime laboratories. (Research Paper) (Spring—day)

475 **Law and Criminology I: Search for the Causes of Criminal Behavior** (2) Courtless

Role which criminological knowledge of crime causation may play in assisting lawyers to appraise the effectiveness of various alternative social and legal devices in controlling deviant behavior. The search for factors related to criminal behavior will be developed historically, with emphasis on current causal theories developed by various disciplines. Model as well as operational penal codes, sentencing and probation practices, and specialized facilities will be analyzed in terms of their relationship to such causal theories. (Research Paper) (Fall—day)

476 **Law and Criminology II: Society's Responses to the Criminal Offender** (2) Courtless

Study of the development and current use of society's three major approaches to the handling of offenders: punitive, mechanical, and correctional. Emphasis on society's changing responses to criminal and delinquent behavior, and research findings concerning effectiveness of these responses. Analysis of treatment strategies to facilitate communication between members of the legal profession and behavior scientists charged with effectuating these strategies. Prerequisite: Law 475. (Research Paper) (Spring—day)

478 **Post-conviction Dispositions** (2) Axilbund

Study of the practice, problems, and alternatives facing a defendant, and discussion of the goals and standards for the criminal justice system. Enrollment limited to 25 students. Students who receive credit for Law 478 cannot receive credit for Law 480. (Examination) (Spring—day)

479 **Seminar: Criminal Practice** (2) Foster, Weisberg

Tactical and practical applications of criminal law; mastery of techniques in trying criminal cases. Class sessions built around mock problems based on actual criminal cases; student role-playing as defense attorneys and prosecutors. All phases of criminal trial work covered—client relations, investigation, discovery, trial preparation; particular emphasis on courtroom techniques—direct and cross examination, impeachment, refreshing recollection, laying foundations for exhibits, argument, and courtroom demeanor. Though many of the mock problems are written from a defense viewpoint, techniques taught are relevant to both prosecution and defense. Enrollment limited to 15 third-year and graduate students. Prerequisite: Law 334. Students may elect to receive either a numerical grade or the grade *CR* (credit) or *NC* (no credit). (Fall and spring—evening)

480 **Law of Criminal Corrections** (2) Cripe

Study of two principal areas: (1) sentencing procedures, including probation, parole, and imprisonment; (2) legal rights of prisoners. Enrollment limited to 25 students. Students who receive credit for Law 480 cannot receive credit for Law 478. (Examination) (Fall—evening)

485 **Seminar: Health Care Delivery Systems** (2) Sharpe

Study of the role of the lawyer in existing and proposed national systems for delivering health care. Students will gain familiarity with the concepts and terms in health care delivery by working with issues in the design, finance, and administration of existing arrangements; examination of the means of reconciling the expectations of various groups of health care service consumers and providers. (Research Paper)

486 **Seminar: Law and Psychiatry** (2) Zenoff, Kirby

Designed to expose the lawyer to basic constructs of psychiatry and psychology and to explore their implications in legal rules and practice. Psychiatrists and psychologists actively involved in teaching process. Topics include psychological testing and other assessment techniques, psychiatric evaluations and reports, child custody and other family law issues, privilege and confidentiality, competency in civil and criminal contexts, criminal law matters (including criminal responsibility and dispositional issues), civil commitment, right to treatment, right to refuse treatment, experimental procedures, and informed consent. Problems of counseling, legal ethics, preparation for trial, direct and cross examination, and other aspects of practice considered. There is ordinarily at least one session in a mental institution. (Research Paper) (Fall—day; summer 1977)

Other Related Courses

390 *Forensic Medicine*
591 *Legislative Drafting*
592 *Seminar: Constitutional Law*

LAW, SCIENCE, AND TECHNOLOGY

Faculty Adviser: H.P. Green

491 **Computers and the Law** (3) Chandler

A critical study of selected major legal problems presented by new computer technology, including the impact upon legal doctrine and legal institutions. Jurimetrics, the theory of various uses that are and may be made of computers in legal research, the practice of law, and court administration will be examined. Familiarity with the rudiments of computer science or programming would be helpful, but is not required. (Examination) (Fall—day)

492 **Seminar: Science and the Legal Process** (2) H. Green

Reciprocal relationships between law and science; absorption of scientific concepts into substantive law through adjudication, legislation, and rule-making; techniques and procedures used in handling, developing, and deciding scientific issues. (Research Paper) (Fall—evening)

494 **Use and Control of Nuclear Energy** (2) H. Green, Malsch

Development of law and legal institutions to deal with revolutionary scientific developments in nuclear energy. Laws and regulations concerning peaceful uses of nuclear energy, including licensing, safety, environmental, security, and antitrust considerations. (Research Paper) (Spring—evening)

495 **Legal Protection against Technological Hazards** (2) Dembling, Brown

The growth and development of law and legal institutions to protect so ciety against the hazards inherent in new technologies with particular em phasis on the progress of reconciling the protection of the public with the desire for rapid progress. (Research Paper)

Other Related Courses

380 *Environmental Law*
381 *Environmental Planning*
402 *Executive Function*
412 *Food and Drug Law*
413 *Public Policy and Mass Media*
431 *Government Procurement Law*
505 *Intergovernmental Relations I*
531 *International Law of Air and Space*
532 *International Law of the Sea*

LAND USE MANAGEMENT AND CONTROL

Faculty Advisers: J.M. Brown, L.A. Schiller, J.P. Chandler

501 **Land Development Law** (3) Brown

Study of the basic public and private means used by society to manage and control land use, such as zoning, subdivision regulation, pending ordi eminent domain, and privately contracted conditions, covenants, and re strictions. Identification and analysis of emerging new land control proc esses and the roles played by public and private entities involved in or affected by land use management and control efforts at the various echel lons of government. Students participate in a game-simulation process representing a specific complex situation in land use conflicts involving their inherent technological, social, economic, political, and legal elements In the model situation students will assume roles as attorneys and work with assigned "clients." (Client-oriented written work and class participa tion.) Enrollment limited by the instructor. (Fall—day)

502 **Water Resources Law** (2) Hedeman

Introductory survey course in the law relating to water resources. History and development of water rights systems in the United States using a com parative analysis of Eastern and Western water law doctrines, the trend toward their modification, and study of the increasing influence of federal laws and projects. Identification of federal-state-local relationships, con flicts, and institutions; consideration of river-basin management and inter basin transfers; description of proposed creation of new sources. (Examination) (Fall—evening; summer 1977)

504 **Seminar: Current Problems in Land Use Controls** (2) Brown, Schiller

New and emerging concepts of regionalism considered in the light of actual problem situations and attempts being made by various echelons of government to provide effective and equitable land use management and control. Examination of actual problem areas of major concern, including

constitutional, administrative, political, judicial, social, economic, and technological elements. Functional planning and decision-making with respect to selected problem areas and their strategical and tactical transactions examined within the compass of the broader policy considerations involved. Guest lecturers; clinical exposure to various government agencies responsible for cooperating with the selected problems. (Research Paper) (Spring—day)

505 **Intergovernmental Relations I** (2) **Nash**

Study of federalism, emphasizing current techniques for achieving cooperation and coordination between federal, state, and local governments. Detailed consideration of devices used, including interstate compacts, grants-in-aid, and exercise of regulatory powers. (Research Paper) (Fall—day)

506 **Intergovernmental Relations II** (2) **Nash**

Advanced seminar on multi-government activities and current topics on intergovernmental relations. (Research Paper) (Spring—day)

Master of Laws candidates in the area of Land Use Management and Control who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

327 *Modern Real Estate Transactions*
349 *Local Government Law*
372 *Administrative Law*
380 *Environmental Law*
381 *Environmental Planning*

Other Related Courses

451 *Federal Poverty Legislation*
460 *Current Problems in Civil Rights*
492 *Seminar: Science and the Legal Process*
494 *Use and Control of Nuclear Energy*
495 *Legal Protection against Technological Hazards*
558 *Taxation—Real Estate and Income*
560 *Taxation—State and Local*
591 *Legislative Drafting*
593 *Seminar: American Legal History*

ENVIRONMENTAL LAW

Faculty Adviser: A.W. Reitze, Jr.

508 **Environmental Litigation** (2) **Miller, Steenland**

Special problems of environmental lawsuits. Topics include pleadings, procedural problems, selection of the proper court, problems of proof, remedies, selection of parties, discovery techniques and trial preparation, and the use of expert witnesses and scientific evidence. Prerequisite: Law 380 or graduate status. Enrollment limited to 25 students. (Choice of Research Paper or Clinical Work) (Spring—evening)

509 **Clinical Studies in Environmental Law** (2 or 3 or 4) Reitz

The student works on a project in the environmental law field under the supervision of both the faculty director of the program and a lawyer practicing environmental law. The project may involve working with a government agency, a congressional committee, a private practitioner, or a nonprofit public-interest environmental organization. Admission to this course requires second-semester second-year, third-year, or graduate standing and permission of the Director of the Environmental Law Program. Students who have mastered the fundamentals of environmental law are selected for this course. Normally this will require completion of at least Law 380. In addition, consideration will be based on the other environmentally related courses taken including those in Natural Resources Law and in Law, Science, and Technology, as well as work experience and other demonstrated interest in environmental law. Students may repeat this course for a maximum of 8 semester hours of credit. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall—day)

510 **Energy** (2) Cudahy

Energy policy, price and allocation controls, and other FEA regulation FPC regulation of gas, coal conversion, funding energy research, development and capital needs, selected energy conservation topics. (Examination (Spring—evening)

Master of Laws candidates in the area of Environmental Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

380 *Environmental Law*
381 *Environmental Planning*

Master of Laws candidates specializing in Environmental Law or Land Use Management and Control may use the following courses to complete the degree requirements.

598 *Research in Public Law*
599–600 *Thesis*

Other Related Courses

413 *Public Policy and Mass Media*
431 *Government Procurement Law*
492 *Seminar: Science and the Legal Process*
494 *Use and Control of Nuclear Energy*
495 *Legal Protection against Technological Hazards*
501 *Land Development Law*
502 *Water Resources Law*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
532 *International Law of the Sea*
560 *Taxation—State and Local*
571 *Land Development Planning*
591 *Legislative Drafting*

PATENT AND TRADE REGULATION LAW

Faculty Advisers: I. Kayton, G.E. Weston

522 **Patent and Know-how Licensing** (2) Brunsvold

The business and legal criteria necessary to implement and maintain successful licensing programs; emphasis on the strategy and techniques that permit a proprietor of intellectual property to effectively exploit his status as the owner of a unique form of property. Subject areas covered are business objectives in licensing; legal outline of licensing situations; rights and duties of license parties; factors in selecting which inventions to license—financial, legal, and commercial; finding and selecting the right licensees; determining and negotiating the terms and clauses of the contract; administering and enforcing the license; antitrust and misuse constraints on the business and law of licensing; tax factors affecting the patent and know-how contract; special problems in trade secret, know-how, and show-how contracts; international licensing. Prerequisite: Law 359 and 362, or former Law 360. (Choice of Paper or Examination) (Spring, odd years—evening)

523 **Court Review of Patent Office Decisions** (2) Dunner

Procedure and procedural law involved in appealing to the U.S. Court of Customs and Patent Appeals and the U.S. District Courts from administrative decisions in the U.S. Patent Office. Designed to provide an exhaustive step-by-step procedural progression through *ex parte* and *inter partes* patent and trademark appeals. Emphasis on the forms used in the many motions and proceedings before the U.S. Court of Customs and Patent Appeals and the District Courts required to perfect an appeal. Attendance at and critique of actual court proceedings. Introductory material includes administrative appeals before the U.S. Patent Office Board of Appeals. Prerequisite: Law 359 and 362, or former Law 360; or the equivalent in experience. (Examination) (Fall, even years—evening)

524 **Chemical Patent Practice (2)** White

Seminar covering patent application preparation, prosecution, appeals, and licensing which are peculiar to chemical patent practice. Prerequisite: Law 359 and 362, or former Law 360; or comparable experience in the practice of patent law. (Examination) (Fall, even years—evening)

525 **Copyright Law** (2) Moore

Historical background; formalities and essentials in securing a copyright; subject matter of copyright; remedies; international aspects of copyright under Berne Union, Universal Copyright Convention, Inter-American Convention; copyright licensing and performing rights societies. (Examination) (Spring—evening)

526 **U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks** (2) Leeds

Procedural and substantive law on use, registration, and protection of trademarks, including detailed registration procedure in the U.S. Patent and Trademark Office, common law rights to marks, and licensing and franchising arrangements. Prerequisite: Law 329. (Examination) (Fall, odd years)

527 **Advanced Topics in Patent Law** (2)

Multidisciplinary consideration in depth of current industrial-intellectua property problems; licensing and protection of industrial property; use and abuses of patents; governmental regulation; protection and transac tions abroad; international treaties and arrangements; role of patents trademarks, and trade secrets in business; economic and social function of patents, trademarks, and copyrights. Students are exposed to pertinen source materials, professional research methods and techniques. Oppor tunity for oral presentation and discussion of term papers prior to sub mission is provided to encourage instructional dialogue among students and the investigation and analysis of issues. Prerequisite: Law 359 and 362, or former Law 360; or the equivalent in experience. (Research Paper)

528 **Patent Interference Practice** (2) Klitzman

Procedure and practice in inter partes determination of priority of inven tion in the U.S. Patent Office. Topics: conception, reduction to practice diligence, corroboration, preliminary statements, motions, and testi mony practice and final hearing. Also covered are current problem areas such as inventor determination, discovery, and privilege. Students re quired to draft procedural document selected from categories of prelim nary statements and various interference motions. Prerequisite: Law 359 and 362, or former Law 360. (Examination) (Spring, even years)

529 **Research in Patent, Trademark, and Copyright Law** (2) Kayton

Prerequisite: Law 417, and related courses; and a *B* average. Request in writing, with proposed outline of topic of research, must be submitted to the Dean at least one month prior to registration day. Work must be completed within the semester and paper submitted not later than last day of classes. Graduate students may repeat this course once for credit with the approval of the Dean. (Research Paper)

Master of Laws candidates in the area of Patent and Trade Regulation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
359 *Patent Law*
362 *Patent Office Practice*

Other Related Courses

412 *Food and Drug Law*
417 *Seminar: Trade Regulation*
427 *Legal Aspects of International Business Transactions*
431 *Government Procurement Law*
492 *Seminar: Science and the Legal Process*
541 *Seminar: European Common Market*
562 *Income Taxation of Foreign Business and Investment*

INTERNATIONAL AND COMPARATIVE LAW

Faculty Adviser: International Law—W.T. Mallison

Faculty Adviser: Comparative Law—H. J. Liebesny

531 **International Law of Air and Space** (2) Dembling

Study of the development of international law relating to the use of air space and outer space; analysis of air and space treaties in force; the role of various intergovernmental and nongovernmental international organizations; consideration of special problems such as liability resulting from space activities, space technology and arms control, and pollution and contamination of outer space; earth resources, sensing, etc. Enrollment limited to 25 students. (Research Paper) (Fall—evening)

532 **International Law of the Sea** (2) Muys

International law affecting allocation of authority over ocean space. Development of international law concerning territorial sea, contiguous zone, high seas, continental shelf, and deep seabed. Current legal and policy issues associated with these areas. (Examination) (Spring—evening)

533 **Legal Regulation of International Coercion** (2) Mallison, Jabri

Process of legal decision during war and at times when expectations of violence are high—contemporary international law of war and coercive measures short of war, such as limited naval blockade; legal aspects of modern methods of coercion—economic, political, psychological, and military; limited war and modes of preventing "escalation" to total war; regulation of hostilities including protection of war victims, civilian persons, and prisoners of war; war crimes and punishment; problems concerning weapons of mass destruction; legal control of terra; and problems of transforming coercion situations to minimum order ones. (Research Paper) (Spring—day)

535 **Negotiation: Concepts and Techniques** (2) Ramundo, Tankel

Role of the lawyer and policy maker (client) in private, intragovernmental, and international negotiations; negotiations in private practice and governmental operations; achievement of consensus among contentious parties; negotiating techniques, including effective use of the "fallback"; gaming exercises in the actual conducting of negotiations, with practical work in the preparation of claim letters, agency and national positions, and negotiating instructions. Enrollment limited by the instructors. (Writing Assignments) (Spring—evening; summer 1977)

536 **Diplomatic and Consular Law and Practice** (1) Mitchell

Development of diplomatic and consular relations between nations; legal rights, privileges, functions, and immunities of diplomatic and consular personnel; extent of immunity from jurisdiction of foreign government missions and representatives; problems of taxation affecting foreign government missions and personnel. (Research Paper)

537 **The International Law of Human Rights** (2) del Russo

Theory of fundamental freedoms from its philosophical to its legal formulation in the American and French Revolutions, the individual vis-à-vis the State, human rights as rights against the national government, the emerging of the individual in the law of nations as a subject of rights and duties, the individual as subject of international concern, social and

political forces stressing the need for international recognition and protection of human rights, the setting of human rights standards. The Universal Declaration and its influence over the law of nations, critical assessment of the work of the UN in the human rights field, regional approach to the international protection of human rights, analysis of the case law of the European Convention, human rights in the Inter-American system, state sovereignty and the international protection of human rights, a comparative approach to human rights protection at the national level, due process and freedom of speech in light of different legal systems. (Research Paper) (Fall—day)

540 **Choice of Law and Forum in Transnational Contracts, Techniques of Conflict Avoidance** (2) Delaume

Problems confronting the practitioner who endeavors to anticipate conflicts before they arise. Conflicts rules for transnational contracts; internationalization of contracts involving sovereign and international organizations. Techniques of conflict avoidance; express choice of law; conflict avoidance in absence of express stipulation of applicable law. Effectiveness of conflict avoidance; interrelationship of conflicts law and comparative law. (Research Paper) (Spring—evening)

541 **Seminar: European Common Market** (2) Echols

Analysis of treaty establishing European Economic Community; institutions of EEC and of member states and the internal law of member states as they affect doing business in EEC; series of problems arising out of ex-



tablishing and operating business with and within EEC. Background in international law and antitrust law desirable. (Research Paper) (Fall —day)

546 **Soviet Law (2)** **Ramundo**

Concept of "socialist legality"; legal relationship of individual to state and other participants in Soviet society; role of Party in Soviet legal system; Soviet philosophy of law; state (constitutional) law: Soviet federalism, governmental apparatus, rights and obligations of citizenship; criminal law; property law; labor law; selected topics in civil law and procedure; international law. (Choice of Paper or Examination) (Fall—evening)

547 **Chinese Law (2)** **Hsia**

Emphasis on the legal system of Communist China; analysis of the constitutional law of the People's Republic of China, including general principles, state structure, and rights and duties of citizens; a brief survey of the administration of justice—courts, procuratorates, and lawyers; marriage law; land law; counterrevolutionary act and other criminal statutes; principles of civil law; Communist Chinese concept of international law. (Research Paper) (Spring—evening)

548 **Law of the Near East (2)** **Liebesny**

Law of the Arab countries, Turkey, and Iran, including basic principles of Islamic law, analysis of the present day codes, and investigation of the Western influences on laws of these countries. (Examination)

Master of Laws candidates in the area of Public International and Comparative Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

302 *Admiralty*
303 *International Law and World Order*
304 *United Nations Law and World Order*
307 *Comparative Law*
309 *Conflicts of Laws*

Other Related Courses

427 *Legal Aspects of International Business Transactions*
494 *Use and Control of Nuclear Energy*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
562 *Income Taxation of Foreign Business and Investment*

TAXATION

Faculty Advisers: J.R. Hambrick, D.B. Weaver, R.F. Fielding, L.D. Solomon

551 **Taxation—Partnerships and Subchapter S (2)** Weaver, Sanders

Income tax problems of partnerships and tax-option corporations (Subchapters K and S of the Internal Revenue Code of 1954). Prerequisite: Law 336. (Examination) (Spring—evening)

553 **Seminar: Estate Planning** (2) Weave

Study of the effective disposition of wealth by inter vivos gift and testa-
mentary transfer; emphasis on income, estate, and gift tax considerations;
use of the trust form in the transfer of wealth; use of insurance and
jointly held property as part of the estate plan; planning for the continu-
ation or disposition of the client's business interests. Preparation of a
estate plan, with supporting documents is the major project for the cours
Prerequisite: Law 325, 326, 336, and 338. Enrollment limited by the
instructor. (Problem Assignments) (Spring—evening; summer 19—

554 **Taxation—Deferred Compensation** (2) Chabo

Tax and labor law consequences of deferred compensation. Examina-
tion of new standards imposed by Employee Retirement Security Act o
1974. Consideration of tax consequences of "unqualified" plans, lump
sum distributions, individual retirement accounts, and new requirement
that defined benefit plans be insured by the Pension Benefit Guaranty
Corporation. Prerequisite: Law 336. (Problem Assignments and Examin-
nation) (Fall—evening)

555 **Taxation—Special Corporation Problems** (2) Libin, Davi

Detailed study of the principal federal tax benefits of the corporate form
of doing business. Consideration of problems involved in the tax planning
of the corporate structure and corporate operation, including the tax defi-
nition of a corporation, the special deductions available to corporate
payers, the compensation of the corporate executive and employee, the
debt-equity question, the accumulated earnings tax, the personal holding
company tax, multiple corporations, and consolidated returns. Survey of
the types of corporations receiving special treatment under the Interna
Revenue Code, such as financial institutions, real estate investment trusts
regulated investment companies, cooperatives, and small business corpora-
tions. Prerequisite: Law 340. (Research Paper) (Spring—evening

557 **Taxation—Exempt Organizations** (2) Hopkins, Myer

Tax-exempt organizations: policy and practice of preferred tax treatment
for selected organizations and gifts to them. Statutes, regulations, and
IRS practice; legislative origins, judicial interpretations, and policy con-
sideration. Tests of qualification, disqualification, and limited tax prefer-
ence. Mechanics of securing and retaining exemption; qualified exemp-
tion; unrelated business income; private inurement, political activity. De-
nial or loss of exemption. Return and reporting requirements. Comparat
tive tax treatment of nonexempt and nonprofit organizations. Spec
sanctions with respect to private foundations, managers, and donors for
improper, excessive, or prohibited activities. Enrollment may be limited
Prerequisite: Law 336. (Examination) (Fall—evening)

558 **Taxation—Real Estate and Income** (2) Tucke

The effect of income taxes on the real estate market and real estate tran
actions: sales and exchange of real estate interests; various entities for th
ownership and development of real estate; the impact of taxes on th
landlord and tenant; the impact of taxes on the mortgagor and mortgagee
including the choice of financing techniques, such as the sale-leaseback
depreciation, amortization, and obsolescence; basis and basis adjustments
and casualties and other involuntary conversions. Prerequisite: Law 33
(Examination) (Spring—evening)

559 **Taxation—Oil and Gas** (2) Hambric

Application of federal income tax law to producing segment of oil an

gas industry. Classification of interests; treatment of exploration and development expenditures. Depletion allowance and concept of "economic interests." Sales vs. "leasing" transactions. Organization problems. Prerequisite: Law 336. (Examination)

560 **Taxation—State and Local** (2) Field

Taxation by state and local governments; problems of real and personal property taxation, sales and use taxes, business and personal income taxes. Limitations on taxation of interstate commerce. Congressional problems. (Choice of Research Paper or Examination) (Spring—evening; summer 1977)

562 **Income Taxation of Foreign Business and Investment** (2) Hambrick

The provisions and policies of the federal income tax law applicable to foreign income, including considerations affecting the choice of methods of engaging in foreign business and investment, treatment of controlled foreign corporations, allocation of income in foreign commerce, credit for foreign taxes, principles and trends of U.S. tax treaties. (Examination) (Spring—evening)

564 **Seminar: Special Problems of Tax Policy** (2) Field, A. Singer

Intensive study of selected aspects of the tax structure with primary attention given to the federal income tax. Problem areas are reviewed primarily from the standpoint of tax policy, including legal, economic, social, and practical considerations. Alternative solutions, including current legislative proposals, are examined. Prerequisite: Law 336, 340. (Research Paper) (Fall—evening)

567 **Seminar: Tax Practice and Procedure** (2) Muoio

Review of the major areas of tax practice, including organization of the Internal Revenue Service, legislation, administrative regulations, tax planning, tax rulings, tax audit, settlement procedures, claims for refund, tax collection processes, criminal tax practice, and ethical problems in tax practice. Preparation of various documents is required. Prerequisite: 5 semester hours of taxation, including Law 336. (Problem Assignments) (Fall—evening)

568 **Seminar: Federal Tax Litigation** (2) S. Cohen, London

Choice of forum. Conduct of civil tax cases: trial practice in the Tax Court, the District Courts, and the Court of Claims; appeal practice in the Courts of Appeals and on certiorari to the Supreme Court; analysis and drafting of pleadings, motions, and briefs; oral argument; settlements and stipulations of fact. Comparative responsibilities and procedures of IRS and of the Department of Justice for litigation control. Prerequisite: Law 567. (Writing Assignments) (Spring—evening)

Master of Laws candidates in the area of Taxation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

336 *Taxation—Federal Income*
338 *Taxation—Federal Estate and Gift*
340 *Taxation—Federal Income, Corporations and Shareholders*
351 *Law and Accounting*

Other Related Courses

404 *Securities Regulation*
424 *Business Planning*
427 *Legal Aspects of International Business Transactions*

URBAN LEGAL STUDIES

Faculty Advisers: M. Pock, D.P. Rothschild

571 **Land Development Planning** (3) McGrath*

Selected problems in urban and regional planning: applications of zoning, urban renewal, and special programs available for the implementation of development plans. Enrollment limited by the instructor. (Examination and Paper) (Spring—evening)

575 **Community Economic Development** (2) Stevenson

A substantive study of the organizational, financial, and tax-planning aspects of nonprofit, cooperative, and small business organizations. Problems illustrating some of the legal considerations of a nonprofit organization and a small business. Consideration of the problems of economic development and current efforts to stimulate it. Enrollment limited to 25 students. Prerequisite: Law 312, 336. (Problem Assignments)

579 **Clinical Studies in Urban Law** (2, 3, or 4) Sirulnik, Staff

Open to second- and third-year students. Participants work in the National Center's Community Legal Clinic, a diverse legal service institution offering a variety of litigation and nonlitigation advocacy opportunities in civil representation. Under the supervision of the Director and two attorney-instructors, such skills as interviewing, counseling, drafting, negotiations, civil litigation, and administrative practice are learned while serving various segments of the city's low-income populace, including representing the elderly through a special program. Third-year students are eligible to participate in the course as student litigators in the District of Columbia Superior Court. Students may also earn credit working for other public interest law institutions or government agencies. Students who perform 10 hours' service each week for the semester receive 2 semester hours of credit; those performing 15 hours' service receive 3 semester hours; those performing 20 hours' service receive 4 semester hours. May be repeated for credit not to exceed 8 semester hours. The course may not be taken at the same time as Law 345, or any litigation activities in Law 346. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer 1977)

Descriptions for the other courses in this area (listed below) appear elsewhere in "Advanced Courses."

451 **Federal Poverty Legislation** (2)
459 **Problems of the Consumer** (2 or 3)
501 **Land Development Law** (3)
505 **Intergovernmental Relations I** (2)
506 **Intergovernmental Relations II** (2)
560 **Taxation—State and Local** (2)

* Dorn Charles McGrath, Jr., is Professor of Urban Planning and Chairman of the Department of Urban and Regional Planning in the School of Government and Business Administration.

Master of Laws candidates in the area of Urban Legal Studies who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

349 *Local Government Law*
445 *Labor Relations in State and Local Governments*

Other Related Courses

460 *Current Problems in Civil Rights*
475 *Law and Criminology I: Search for the Causes of Criminal Behavior*
476 *Law and Criminology II: Society's Responses to the Criminal Offender*
592 *Seminar: Constitutional Law*

OTHER ADVANCED COURSES

586 **Immigration Law** (2) **Mancini**

Law and practice under the McCarran-Walter Act, involving questions of immigration, emigration, expatriation, nationality and naturalization. Consular, Immigration and Naturalization Service, and Labor Department practice. (Examination) (Fall—evening)

587 **Individual Rights and Liberties** (3) **Miller**

Principles of equality and due process in the 5th and 14th amendments. The power of Congress to enforce the 14th amendment. Focus on individual rights and liberties under the U.S. Constitution. First amendment rights, particularly religion and speech clauses. The right of association. Other personal rights in the Bill of Rights. Methodology of judges in deciding cases involving individual rights and liberties, particularly the "balancing test" and the judges' views of societal interests. Prerequisite: Law 212. (Research Paper)

588 **Legal Problems in Education** (2) Long, Smalls

Public policy issues involving individual liberties and governmental obligations examined in the context of government's participation in education. Issues covered include legal framework within which states regulate schools, rights of students and teachers, obligations to avoid discrimination and provide equal educational opportunities, and role of courts, legislators, and educational officials in resolving such issues. (Research Paper) (Spring—day)

591 **Legislative Drafting** (2) **Zweben**

Advanced instruction and practice in legislative drafting; overview of legislative process with emphasis on legislative drafting. Enrollment limited to 30 students. (Problem Assignments) (Spring—evening)

592 **Seminar: Constitutional Law** (2) **H. Green, Silard**

Group study of contemporary problems in constitutional law; process of constitutional litigation; problems of effectuating constitutional guarantees. (Research Paper) (Fall—day)

593 Seminar: American Legal History (2) D. Gre

From the outbreak of the Revolution at Lexington and Concord to t death of John Marshall. An examination of men, events, and moveme significant in the unfolding of our laws and legal institutions in this form tive period of our national life, including a critical examination of t place of the lawyer in a revolutionary age. Comparison of the role of lawyer during the politically and socially unsettled time of Marshall w the role of the lawyer in today's troubled scene. Members of the semi present the results of their research and thought either by oral or writ reports. The grade of *CR* (Credit) or *NC* (No Credit) is given for t course. (Problem Assignments) (Fall—as arranged)

594 Professional Responsibility (2) Sharpe, Upt

Ethical problems in civil and criminal litigation. Loyalty to the clie Financing of legal services. Etiquette of acquiring and retaining clie Procedures and problems in legal discipline. Special responsibilities of t government lawyer. Ethical conduct of judges. Issues in *pro bono publ* practice. Ethical responsibilities of law professors. Plea bargaining. R of the American Bar Association. (Examination) (Spring—day a evening)

595 Seminar: Supreme Court Practice (2)

Study of the jurisdiction, practice, and procedure of the Supreme Court the United States. Certiorari and appeal; the Court's Rules of Practi how to prepare petitions and jurisdictional statements; the internal ope tion of the Supreme Court; other related aspects of Supreme Court pr tice, such as bail and stay applications, use of extraordinary writs, moti practice, oral argument, and briefing; *in forma pauperis* procedures. S dents will prepare documents used in Supreme Court practice—petitio for certiorari, jurisdictional statements, and opposing briefs and argume —using the actual conference list of cases pending before the Court. (A search Paper)

597 Independent Studies (arr.)

Limited to teaching fellows. The proposed program of study must submitted to a faculty member in writing and approved prior to the ginning of the semester. May not be elected for more than 12 seme hours of credit. (Fall and spring)

598 Research in Public Law (2)

Limited to graduate students with at least a *B* average who have seminar or comparable course in field of proposed research. Students responsible for obtaining an adviser from the full-time faculty wh willing to sponsor their research. This adviser's name must be submi to the Dean at registration. Work must be completed within the seme Sudents may repeat this course once for credit with the approval of Dean. (Research Paper) (Fall, spring, summer)

599–600 Thesis (2–2)

Students must register for two successive semesters. It is recommen that they not register for both sections in one semester. (Fall, sp summer)

SPECIAL PROGRAMS IN RESEARCH AND INSTRUCTION

ENVIRONMENTAL LAW PROGRAM

Director A.W. Reitze

The Environmental Law Program seeks to provide both academic and clinical experience in the environmental law field. The program is predicated on an exchange of information and experience between the academic community and the world of the practicing attorney. The result is a forum for presentation, discussion, and implementation of legal avenues to cope with the critical environmental issues of the present and future generations. These goals are achieved through courses, seminars, research projects, and clinical activities.

GOVERNMENT CONTRACTS PROGRAM

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A comprehensive government contracts program provides continuing instruction for industry and government personnel in this field and a program of courses leading to the Master of Laws degree in Government Procurement Law. The program includes (1) short seminars, (2) one-week courses in advanced problems in the field, (3) an annual institute treating a problem of contemporary importance, (4) an annual conference in a major area, (5) compilation of materials for use in current courses, (6) publication of a series of monographs treating special problems in the field, and (7) special research projects.

INTERNATIONAL AND COMPARATIVE LAW PROGRAM

Director W.T. Mallison
Associate Director H. J. Liebesny

The objectives of the International and Comparative Law Program are to provide insights into the processes of international law and foreign legal systems. Specific objectives in international law are to provide a better understanding

of decision-making, sanction processes, legal institutions, and the relationshi between domestic and international law. Specific objectives in comparative l include understanding of the basic institutions of civil law countries, the re ception of civil law and common law in non-Western countries, and the ro of decisional law and judicial review in selected legal systems. Improvemen which are needed to promote the rule of law in the world community are al considered. International aspects of business transactions and economic develo ment are included in the Program. The objectives of the Program are imp mented through course work and seminars for both J.D. and post-J.D. degre students and through research and writing in pertinent fields.

LAND USE MANAGEMENT AND CONTROL PROGRAM

Director J.M. Brown

The social, economic, technological, political, and legal interrelationships ge erated by the fact that land is a basic, limited-supply natural resource, capabl of being subjected to differing but concurrent public and private uses, raise growing number of issues involving management policy and control measur which are of critical concern to the future of the nation. The Land Use Ma agement and Control Program, through a combination of academic, clinica and game-simulation processes, seeks to provide an understanding of existi and pending problems, needs, means, and opportunities for solution with respe to this developing area of national concern.

LAW, SCIENCE, AND TECHNOLOGY PROGRAM

Director H.P. Green

The Law, Science, and Technology Program deals with the reciprocal relatio ships between law and science, providing courses, seminars, research studies, a publications to equip the legal profession to deal more effectively with t social, economic, political, and legal consequences of the nation's present m sive commitment to scientific progress.

PATENT LAW PROGRAM

Director Irving Kayton

The Patent Law Program is designed for students in the J.D. and Post-J degree programs whose intentions are to specialize in the practice of patent l During the past eight years an organized program has been developed to o as complete and as integrated a collection of courses in patent law as possi The course offerings in patent law now total 17 semester hours, far more t any other law school in the United States. In addition, courses in tradem and copyright law are also available (see the "Patent and Trade Regulat Law" area of specialization in the "Advanced Courses" section of this bull for a complete list and detailed description of the patent law courses offer The object of the Patent Law Program is to provide the student with a conc tration in patent law at a level of specialization and maturity which will en advancement more rapidly in this field.

THE GEORGE WASHINGTON LAW ASSOCIATION

Director of Law Alumni Relations Clifford A. Dougherty, J.D.(W.H.) 1964

THE GEORGE WASHINGTON LAW ASSOCIATION was founded in 1912 and has been affiliated with the General Alumni Association since 1926. Its purposes as stated in the constitution are to promote high standards of legal education, to keep the alumni of the school in close touch with one another, especially with members of their own classes, to gather and publish at intervals information as to the whereabouts and activities of these alumni, and to further the interests of the school.

Eligible members are those who have matriculated in the school or National University and have left in good standing, and any member or former member of the faculty of the school. Active members are those eligible members who are current contributors to the Law Annual Support Program of the University and life members of the George Washington Law Association.

The Association plans publication periodically of the Law Alumni Directory. Law alumni are urged to keep the Alumni Office informed of their whereabouts so that directory information can be kept up to date.

The Law Alumni Office is in the University Library, 2130 H Street, N.W., Washington, D.C. 20052.

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THE UNIVERSITY

HISTORY AND ORGANIZATION

THE GEORGE WASHINGTON UNIVERSITY had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the

buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area contains several reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education, Government and Business Administration, Public and International Affairs; the College of General Studies; the Division of University Students; the Summer Sessions; and the Division of Experimental Programs.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an ex officio member.

ACADEMIC STATUS

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the United States Information Agency, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, the General Services Administration, the National Academy of Sciences, and the Kennedy Center for the Performing Arts.

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THE NATIONAL LAW CENTER

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EMERITI

Oswald Symister Colclough, *Professor Emeritus of Law; Dean of Faculties Emeritus; Director Emeritus of the Patent, Trademark, and Copyright Research Institute*
B.S. 1920, U.S. Naval Academy; LL.B. 1935, Sc.D. 1961, George Washington University; LL.D. 1946, Muhlenberg College; LL.D. 1958, Dickinson School of Law

William Thomas Fryer, *Professor Emeritus of Law*
B.A. 1922, LL.B. 1924, George Washington University; J.D. 1925, Yale University

Louis James Harris, *Professor Emeritus of Law*
B.A. 1943, Cornell University; LL.B. 1939, S.J.D. 1942, Brooklyn Law School; LL.M. 1948, George Washington University

James Oliver Murdock, *Professor Emeritus of Law*
Ph.B. 1916, University of Chicago; LL.B. 1924, Harvard University

Charles Bernard Nutting, *Professor Emeritus of Law*
B.A. 1927, J.D. 1930, University of Iowa; LL.M. 1932, S.J.D. 1933, Harvard University; LL.D. 1957, University of Pittsburgh; Litt.D. 1957, Geneva College; L.H.D. 1957, Seton Hill College; LL.D. 1960, Dickinson School of Law

ACTIVE

Jeffrey Marshall Albert, *Professor of Law*
B.A. 1956, Princeton University; LL.B. 1959, Harvard University; LL.M. 1962, New York University

Oscar Altshuler, *Professorial Lecturer in Law*
LL.B. 1951, George Washington University

Melvin Axilbund, *Professorial Lecturer in Law*
B.A. 1964, Pennsylvania State University; J.D. 1967, Georgetown University

John Banzhaf III, *Professor of Law*
B.S. in E.E. 1962, Massachusetts Institute of Technology; J.D. 1965, Columbia University

* Professors, Associate Professors, Assistant Professors, and the Librarian of the Law Library constitute the Faculty of the National Law Center. The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the faculty.

Jerome Aure Barron, *Professor of Law*
B.A. 1955, Tufts University; LL.B. 1958, Yale University; LL.M. 1960, George Washington University

Robert Howard Becker, *Professorial Lecturer in Law*
B.S.S. 1951, City University of New York, City College; J.D. 1954, Yale University

Alan Berkeley, *Professorial Lecturer in Law*
B.S. 1964, Cornell University; J.D. 1967, Georgetown University

Hugh Yancey Bernard, Jr., *Professor of Law; Librarian of the Law Library*
B.A. 1941, University of Georgia; B.S. in L.S. 1947, Columbia University; J.D. 1961, George Washington University

Marjorie Harriette Borders, *Adjunct Instructor in Law*
B.S. 1968, J.D. 1972, Howard University

James Milton Brown, *Professor of Law; Director of the Land Use Management and Control Program*
B.A. 1943, University of Illinois; J.D. 1963, University of Florida

Brian Garrett Brunsvold, *Associate Professorial Lecturer in Law*
B.S. 1960, Iowa State University of Science and Technology; J.D. 1967, George Washington University

Gerald Martin Caplan, *Professor of Law*
B.A. 1959, M.A. 1960, J.D. 1963, Northwestern University

Milton Michael Carrow, *Visiting Professor of Law; Director of the Center for Administrative Justice*
B.A. 1933, Syracuse University; J.D. 1937, Harvard University

Herbert Chabot, *Professorial Lecturer in Law*
B.A. 1952, City University of New York, City College; LL.B. 1957, Columbia University; LL.M. 1964, Georgetown University

James Philip Chandler, *Professor of Law*
B.A. 1963, University of California, Berkeley; J.D. 1970, University of California, Davis; LL.M. 1971, Harvard University

Robert Howard Chanin, *Professorial Lecturer in Law*
B.A. 1956, City University of New York, Brooklyn College; LL.B. 1959, Yale University; M.A. 1961, Columbia University

John Cibinic, Jr., *Professor of Law*
B.A. 1956, University of Pittsburgh; J.D. 1960, George Washington University

Sheldon Stanley Cohen, *Professorial Lecturer in Law*
B.A. in Govt. 1950, J.D. 1952, George Washington University

Marcus Cohn, *Professorial Lecturer in Law*
B.A. 1935, J.D. 1938, University of Chicago; LL.M. 1940, Harvard University

Thomas Francis Courtless, Jr., *Professor of Law and of Sociology; Director of the Institute of Law, Psychiatry, and Criminology*
B.A. 1955, Pennsylvania State University; M.A. 1960, Ph.D. 1966, University of Maryland

Clair Allan Cripe, *Professorial Lecturer in Law*
B.A. 1954, Oberlin College; LL.B. 1957, Harvard University

Richard Dickson Cudahy, *Professorial Lecturer in Law*
B.S. 1949, U.S. Military Academy; J.D. 1955, Yale University

Warren Davis, *Assistant Professorial Lecturer in Law*
B.S.F.S. 1969, J.D. 1974, Georgetown University

Georges Rene Delaume, *Professorial Lecturer in Law*
Diplôme de Docteur en Droit 1947, University of Paris; M.Comp.L. 1953, George Washington University

Alessandra Luini del Russo, *Professorial Lecturer in Law*
Doctor Litterarum 1939, University of Milan; Dr.Jur. 1943, University of Pavia; M.Comp.L. 1949, George Washington University

Paul Gerald Dembling, *Professorial Lecturer in Law*
B.A. 1940, M.A. 1942, Rutgers—The State University (New Brunswick); J.D. 1951, George Washington University

James Francis Doherty, *Professorial Lecturer in Law*
B.A. 1953, Catholic University of America; LL.B. 1957, Georgetown University

Linda Colvard Dorian, *Associate Professorial Lecturer in Law*
B.A. 1968, University of Maryland; J.D. 1972, George Washington University

Donald Robert Dunner, *Professorial Lecturer in Law*
B.S. in Ch.E. 1953, Purdue University; J.D. 1958, Georgetown University

Marsha Echols, *Associate Professorial Lecturer in Law*
B.A. 1965, Howard University; J.D. 1968, Georgetown University; LL.M. 1973, Vrije Universiteit, Brussels

Thomas Francis Field, *Professorial Lecturer in Law*
B.A. 1954, University of Notre Dame; M.A. 1958, University of Oxford; J.D. 1961, Harvard University; LL.M. 1968, Georgetown University

Richard Franklin Fielding, *Associate Professor of Law*
B.A. 1966, St. John's College (Maryland); M.A. 1969, J.D. 1973, University of Chicago

Salvatore Francis Fiscina, *Professorial Lecturer in Law*
B.A. 1963, Harvard University; M.D. 1967, University of Rochester; J.D. 1973, George Washington University

Michael Richard Flyer, *Professorial Lecturer in Law*
B.A. 1959, LL.B. 1962, University of Michigan

Mark Foster, *Associate Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1971, Harvard University

Gilbert Jerome Ginsburg, *Professor of Law; Director of the Government Contracts Program*
B.A. 1954, B.A. in Law 1955, J.D. 1957, University of Chicago

Laurence Stephen Gold, *Professorial Lecturer in Law*
B.A. 1958, Princeton University; LL.B. 1961, LL.M. 1962, Harvard University

*David Crittenden Green, *Professor of Law*
B.A. 1948, Harvard University; LL.B. 1951, University of Virginia

Harold Paul Green, *Professor of Law; Director of the Law, Science, and Technology Program*
B.A. 1942, J.D. 1948, University of Chicago

Jackson Reid Hambrick, *Professor of Law*
B.A. 1938, Wofford College; LL.B. 1942, Duke University

John Brooks Harrington, *Adjunct Instructor in Law*
B.A. 1970, University of Oklahoma; J.D. 1976, George Washington University

Gerald Stuart Hartman, *Associate Professorial Lecturer in Law*
B.A. 1966, M.B.A. 1968, Columbia University; J.D. 1972, George Washington University

Murdock Head, *Airlie Professor of Medical and Public Affairs*
D.D.S. 1947, University of Louisville; M.D. 1953, University of Vermont; J.D. 1958, George Washington University

William Norman Hedeman, Jr., *Professorial Lecturer in Law*
B.A. 1964, Gettysburg College; J.D. 1968, University of Maryland; LL.M. 1972, George Washington University

John Roderick Heller III, *Professorial Lecturer in Law*
B.A. 1959, Princeton University; M.A. 1960, LL.B. 1963, Harvard University

Seymour Herman, *Professorial Lecturer in Law*
B.S. 1948, J.D. 1952, New York University; LL.M. 1966, George Washington University

Harold Lester Hirsh, *Professorial Lecturer in Law*
M.D. 1942, Georgetown University; J.D. 1972, American University

Bruce Richard Hopkins, *Professorial Lecturer in Law*
B.A. 1964, University of Michigan; J.D. 1967, LL.M. 1971, George Washington University

Tao-tai Hsia, *Professorial Lecturer in Law*
LL.B. 1945, National Cheng-chi University, China; LL.M. 1950, J.S.D. 1952, Yale University

* On sabbatical leave, spring semester 1978

Radwan Jabri, *Associate Professorial Lecturer in Law*
LL.B. 1965, University of Aleppo; M.C.L. 1968, University of Miami; LL.M. 1970, S.J.D. 1972, George Washington University

John Wingfield Jackson, *Adjunct Professor of Law*
B.S. 1928, University of Pennsylvania; J.D. 1932, George Washington University

Calvin Patrick Johnson, *Associate Professorial Lecturer in Law*
B.A. 1968, University of Santa Clara; J.D. 1971, Stanford University

Alan Hirsh Kaplan, *Professorial Lecturer in Law*
B.A. 1951, LL.M. 1957, New York University; LL.B. 1954, Harvard University

Irving Kayton, *Professor of Law; Director of the Patent Law Program*
B.A. 1951, Cornell University; LL.B. 1957, New York University; LL.M. 1964, J.S.D. 1967, Columbia University

John Alexander Kendrick, *Professorial Lecturer in Law*
B.A. 1942, LL.B. 1943, George Washington University

Edward Kirby, *Professorial Lecturer in Law*
B.S. 1951, M.D. 1956, Howard University

W. Wallace Kirkpatrick, *Professor of Law; Associate Dean of the National Law Center*
B.A. 1934, LL.B. 1938, Harvard University

Maurice Klitzman, *Professorial Lecturer in Law*
B.S. in M.E. 1948, Purdue University; J.D. 1951, George Washington University

Robert Kramer, *Professor of Law; Dean of the National Law Center*
B.A. 1935, LL.B. 1938, Harvard University

Henry West Leeds, *Professorial Lecturer in Law*
B.S. in Econ. 1953, University of Pennsylvania; J.D. 1956, University of Michigan

Jack Lewis, *Professorial Lecturer in Law*
B.A. 1965, Brown University; J.D. 1969, Cornell University

Robinwyn Dietrich Lewis, *Adjunct Instructor in Law*
B.A. 1965, Swarthmore College; M.A. 1971, University of Pennsylvania; J.D. 1974, George Washington University

Jerome Bernard Libin, *Professorial Lecturer in Law*
B.S. 1956, Northwestern University; J.D. 1959, University of Michigan

Herbert Joseph Liebesny, *Visiting Professor of Law; Coordinator, Afghan Legal Training Program*
J.D. 1935, University of Vienna

Barry London, *Lecturer in Law*
B.S. 1968, J.D. 1971, University of Pennsylvania

David Clark Long, *Associate Professorial Lecturer in Law*
B.A. 1961, M.A. 1963, University of Hawaii; J.D. 1966, University of Chicago

William Thomas Mallison, *Professor of Law; Director of the International Law Program*
B.A. 1940, University of Washington; LL.B. 1948, Vanderbilt University; J.S.D. 1967, Yale University

Martin Guilbert Malsch, *Professorial Lecturer in Law*
B.S. 1964, College of the Holy Cross; J.D. 1968, University of Connecticut

Mark Anthony Mancini, *Associate Professorial Lecturer in Law*
B.A. 1970, University of Pennsylvania; J.D. 1973, Temple University

David Marshall, *Adjunct Instructor in Law*
B.A. 1971, Johns Hopkins University; J.D. 1975, American University

Arthur Francis Mathews, *Professorial Lecturer in Law*
B.A. 1959, Union College, New York; J.D. 1962, Union University, New York; LL.M. 1964, Georgetown University

Louis Harkey Mayo, *Professor of Law; Vice President for Policy Studies and Special Projects*
B.S. 1940, U.S. Naval Academy; LL.B. 1949, University of Virginia; J.S.D. 1953, Yale University

Stephen Hull McNamara, *Adjunct Instructor in Law*
B.A. 1964, J.D. 1967, University of Virginia

*Leroy Sorenson Merrifield, *Professor of Law*
B.A. 1938, LL.B. 1941, University of Minnesota; M.P.A. 1942, S.J.D. 1956, Harvard University

George Peter Michaely, Jr., *Professorial Lecturer in Law*
B.S. 1948, LL.B. 1956, University of Notre Dame

Arthur Selwyn Miller, *Professor of Law*
B.A. 1938, Willamette University; LL.B. 1949, Stanford University; J.S.D. 1959, Yale University

Frederick Leon Miller, Jr., *Associate Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1968, Georgetown University; LL.M. 1975, George Washington University

Lawrence Hillel Mirel, *Professorial Lecturer in Law*
B.A. 1957, Oberlin College; LL.B. 1961, Columbia University

Milton Mitchell, *Professorial Lecturer in Law*
J.D. 1942, George Washington University

Waldo Hawthorne Moore, *Professorial Lecturer in Law*
J.D. 1949, M.P.L. 1953, George Washington University

Ralph Anthony Muoio, *Professorial Lecturer in Law*
B.S. 1955, University of Pennsylvania; J.D. 1961, Harvard University

Jerome Christian Muys, *Professorial Lecturer in Law*
B.A. 1954, Princeton University; LL.B. 1957, Stanford University

John Holt Myers, *Professorial Lecturer in Law*
B.A. 1943, Princeton University; LL.B. 1949, University of Michigan; LL.M. 1955, Georgetown University

Ralph Clarke Nash, Jr., *Professor of Law*
B.A. 1953, Princeton University; J.D. 1957, George Washington University

Nicholas Stephen Nunzio, *Professorial Lecturer in Law*
B.A. in Govt. 1957, LL.B. 1960, George Washington University

Lester Nurick, *Professorial Lecturer in Law*
B.S.S. 1934, City University of New York, City College; LL.B. 1937, Brooklyn Law School

Saul Chesterfield Oppenheim, *Distinguished Scholar and Adviser in the National Law Center*
B.A. 1918, M.A. 1920, Columbia University; J.D. 1926, S.J.D. 1929, University of Michigan; LL.D. 1973, George Washington University

Robert Eugene Park, *Professor of Law*
B.S. 1952, B.A. 1957, J.D. 1961, University of Florida; LL.M. 1965, Yale University

David Andreas Peterson, *Professorial Lecturer in Law*
B.A. 1964, Occidental College; J.D. 1967, M.B.A. 1968, George Washington University; M.P.A. 1974, Harvard University; Ph.D. 1975, Johns Hopkins University

David Edward Pinsky, *Professorial Lecturer in Law*
B.A. 1943, LL.B. 1950, University of Pennsylvania

Harvey Pitt, *Professorial Lecturer in Law*
B.A. 1965, City University of New York, City College; J.D. 1968, St. Johns University, New York

Maximilian Pock, *Professor of Law*
J.D. 1958, University of Iowa; S.J.D. 1962, University of Michigan

Edward Andrew Potts, *Professor of Law; Associate Dean of the National Law Center, for Graduate Studies, Research, and Projects*
B.A. 1949, University of Michigan; LL.B. 1952, George Washington University

Bernard Ramundo, *Professorial Lecturer in Law*
B.A. 1947, City University of New York, City College; LL.B. 1949, M.A. 1957, Columbia University; Ph.D. 1966, American University

* On sabbatical leave spring semester 1978.

Arnold Winfred Reitze, *Professor of Law; Director of the Environmental Law Program*
B.A. 1960, Fairleigh Dickinson University; J.D. 1962, Rutgers—The State University (Newark)

David Robinson, Jr., *Professor of Law*
B.A. 1950, Reed College; J.D. 1956, Columbia University; LL.M. 1965, Harvard University

Ruth Olevia Robinson, *Associate Professorial Lecturer in Law*
B.A. 1965, Albright College; J.D. 1968, Vanderbilt University

Donald Phillip Rothschild, *Professor of Law*
B.A. 1950, University of Michigan; J.D. 1965, University of Toledo; LL.M. 1966, Harvard University

Joseph Rubin, *Adjunct Instructor in Law*
B.A. 1971, Yale University; J.D. 1974, Harvard University

Joseph Michael Francis Ryan, Jr., *Professorial Lecturer in Law*
B.A. 1943, St. Joseph's College, Pennsylvania; LL.B. 1950, LL.M. 1952, Georgetown University; Judge, District of Columbia Court of General Sessions

Michael Sanders, *Professorial Lecturer in Law*
B.S. 1960, LL.B. 1964, New York University; LL.M. 1967, Georgetown University

John Edward Scheuermann, *Associate Professorial Lecturer in Law*
B.A. 1966, St. Michael's College; J.D. 1973, Georgetown University

Lewis Aaron Schiller, *Professor of Law*
B.A. 1950, LL.B. 1952, University of Texas at Austin; M.A. 1958, Tufts University

Teresa Moran Schwartz, *Professor of Law*
B.A. 1965, Stanford University; J.D. 1971, George Washington University

Lester Barry Seidel, *Professorial Lecturer in Law*
B.A. 1966, University of Michigan; J.D. 1969, George Washington University; LL.M. 1970, University of Missouri—Columbia

David Earl Seidelson, *Professor of Law*
B.A. 1951, LL.B. 1956, University of Pittsburgh

David James Sharpe, *Professor of Law*
B.A. 1950, University of North Carolina at Chapel Hill; LL.B. 1955, S.J.D. 1969, Harvard University

John Silard, *Professorial Lecturer in Law*
B.A. 1949, LL.B. 1952, Columbia University

Andrew Warren Singer, *Professorial Lecturer in Law*
B.S. in Econ. 1963, University of Pennsylvania; LL.B. 1966, Harvard University

Eric Scott Sirulnik, *Professor of Law; Director of Clinical Programs*
B.A. 1965, Franklin and Marshall College; J.D. 1968, Boston University; LL.M. 1970, George Washington University

Dudley Graham Skinker, *Clerk of the Trial Practice Court*
LL.B. 1940, George Washington University

O'Neal Smalls, *Professor of Law*
B.S. 1964, Tuskegee Institute; J.D. 1967, Harvard University; LL.M. 1975, Georgetown University

Lewis David Solomon, *Professor of Law*
B.A. 1963, Cornell University; J.D. 1966, Yale University

Theodore Irwin Sonde, *Professorial Lecturer in Law*
B.A. 1961, City University of New York, City College; LL.B. 1964, New York University; LL.M. 1967, Georgetown University

William Marvin Speiller, *Professorial Lecturer in Law*
B.S. 1950, LL.B. 1952, Syracuse University; LL.M. 1953, Harvard University

James Edward Starrs, *Professor of Law*
B.A., LL.B. 1958, St. John's University, New York; LL.M. 1959, New York University

Peter Richard Steenland, Jr., *Associate Professorial Lecturer in Law*
B.A. 1967, J.D. 1970, George Washington University

Alexander Louis Stevas, *Professorial Lecturer in Law*
B.A. 1949, LL.B. 1951, George Washington University

*Russell Bennett Stevenson, Jr., *Professor of Law*
B.M.E. 1964, Cornell University; J.D. 1969, Harvard University

Joan H. Strand, *Adjunct Instructor in Law*
B.A. 1972, J.D. 1975, George Washington University

Jerome Kenneth Tankel, *Professorial Lecturer in Law*
B.A. 1957, University of Illinois; J.D. 1963, Harvard University; LL.M. 1968, George Washington University

Robert Max Tobias, *Professorial Lecturer in Law*
B.A. 1965, M.B.A. 1967, University of Michigan; J.D. 1969, George Washington University

Stefan Franklin Tucker, *Professorial Lecturer in Law*
B.B.A. 1960, J.D. 1963, University of Michigan

James Steven Turner, *Adjunct Instructor in Law*
B.A. 1962, J.D. 1969, Ohio State University

Arvin E. Upton, *Professorial Lecturer in Law*
B.A. 1933, Western Kentucky University; J.D. 1940, Harvard University

David Benson Weaver, *Professor of Law*
B.A. 1943, Ohio Wesleyan University; J.D. 1948, Case Western Reserve University

Frederick Weisberg, *Associate Professorial Lecturer in Law*
B.A. 1965, Cornell University; J.D. 1968, University of Michigan

Glen Earl Weston, *Professor of Law*
B.S. 1943, University of Maryland; J.D. 1948, George Washington University

John Leslie White, *Professorial Lecturer in Law*
B.A. 1948, M.S. 1949, Kalamazoo College; J.D. 1958, George Washington University

Elyce Zenoff, *Professor of Law*
B.S. 1951, University of Wisconsin; LL.B. 1954, Northwestern University

Murray Zweben, *Professorial Lecturer in Law*
B.S. 1952, M.S. 1953, State University of New York at Albany; LL.B. 1959, George Washington University

Summary of Registration, Fall Semester 1976–77

	1st year	*2nd year*	*3rd year*	*4th year*	*Graduate*	*Other*
Day	342	335	262	.....	40	22
Evening	116	133	101	93	194	66

Total: 1,704

*On leave of absence, fall semester, 1977; on sabbatical leave, spring semester, 1978.

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COLLEGES AND SCHOOLS—DEGREE PROGRAMS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart. Sc.), Bachelor of Science in Geodesy (B.S. in Geod.), and Bachelor of Science in Oceanography (B.S. in Ocea.)

GRADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.) and Doctor of Philosophy (Ph.D.)

SCHOOL OF MEDICINE AND HEALTH SCIENCES: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

NATIONAL LAW CENTER: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. (Am.Prac.)) and Doctor of Juridical Science (S.J.D.)

SCHOOL OF ENGINEERING AND APPLIED SCIENCE: Bachelor of Science (Civil Engineering) (B.S. (C.E.)), Bachelor of Science (Electrical Engineering) (B.S. (E.E.)), Bachelor of Science (Mechanical Engineering) (B.S. (M.E.)), Master of Engineering Adminisration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.) and Doctor of Science (D.Sc.)

SCHOOL OF EDUCATION: Bachelor of Arts in Education (B.A. in Ed.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education (M.A. in Ed.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.) and Doctor of Education (Ed.D.)

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION: Bachelor of Business Administration (B.B.A.), Bachelor of Science in Administration (B.S. in Adm.), Bachelor of Science in Health Care Administration (B.S. in H.C.A.), Master of Arts in Health Care Administration (M.A. in H.C.A.), Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.), Master of Science in Administration (M.S. in Adm.), Master of Urban and Regional Planning (M. of Urb. and Reg.Plan.), Post-Master's Graduate Certificate in Health Care Administration (Grad.Cert. in H.C.A.), Doctor of Business Administration (D.B.A.) and Doctor of Public Administration (D.P.A.)

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS: Bachelor of Arts (B.A.), Master of Arts (M.A.) and Master of Science in International Affairs (M.S.I.A.)



THE GEORGE WASHINGTON UNIVERSITY

COLUMBIAN COLLEGE OF ARTS AND SCIENCES, 1821

THE GRADUATE SCHOOL OF ARTS AND SCIENCES, 1893

THE SCHOOL OF MEDICINE AND HEALTH SCIENCES, 1825

THE NATIONAL LAW CENTER, 1865

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE, 1884

THE SCHOOL OF EDUCATION, 1907

THE SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION, 19-

THE SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS, 1928

THE DIVISION OF UNIVERSITY STUDENTS, 1930

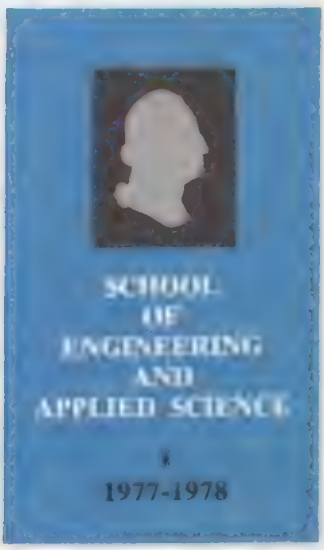
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THE UNIVERSITY HOSPITAL, 1898

THE DIVISION OF EXPERIMENTAL PROGRAMS, 1973

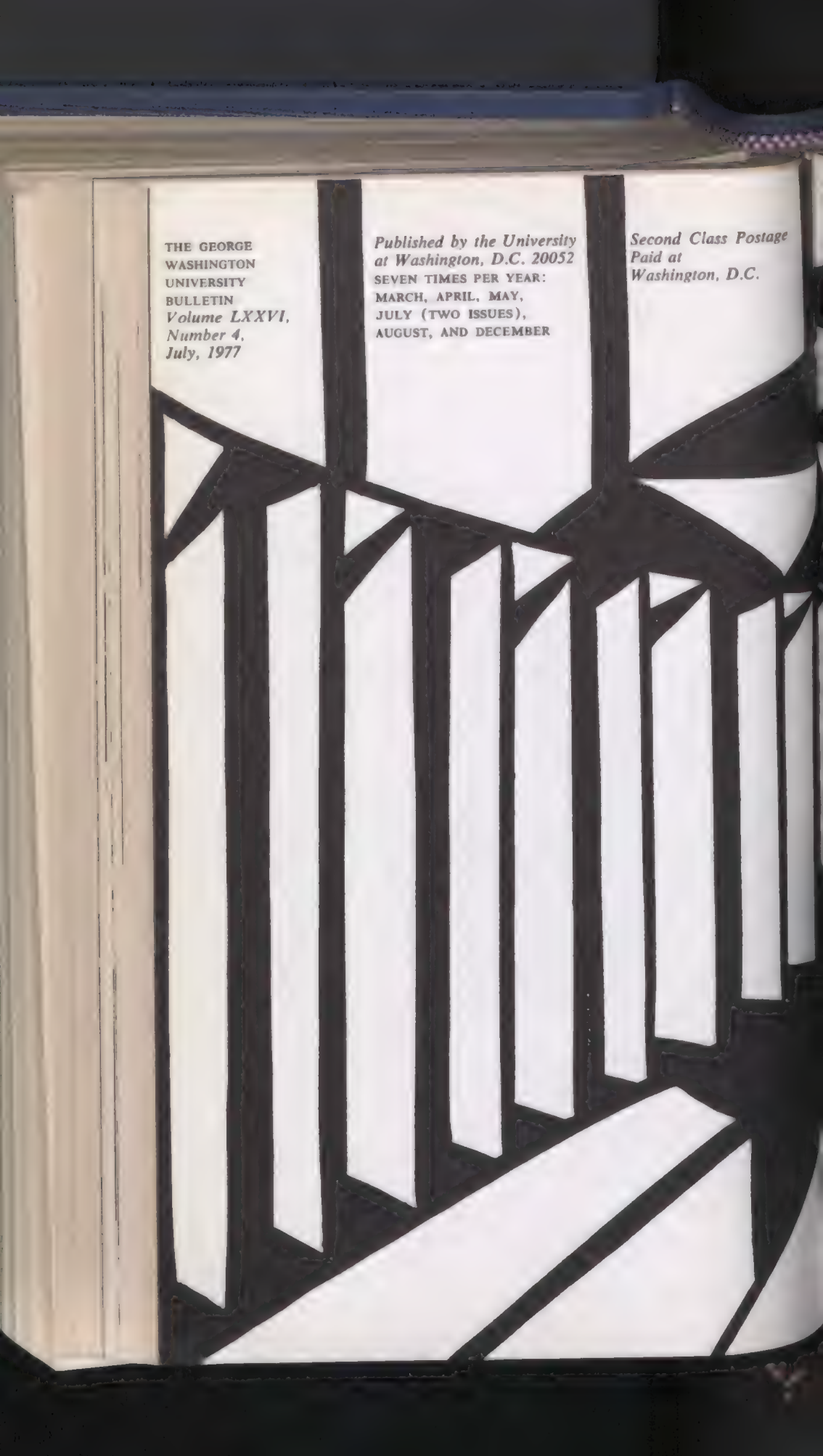
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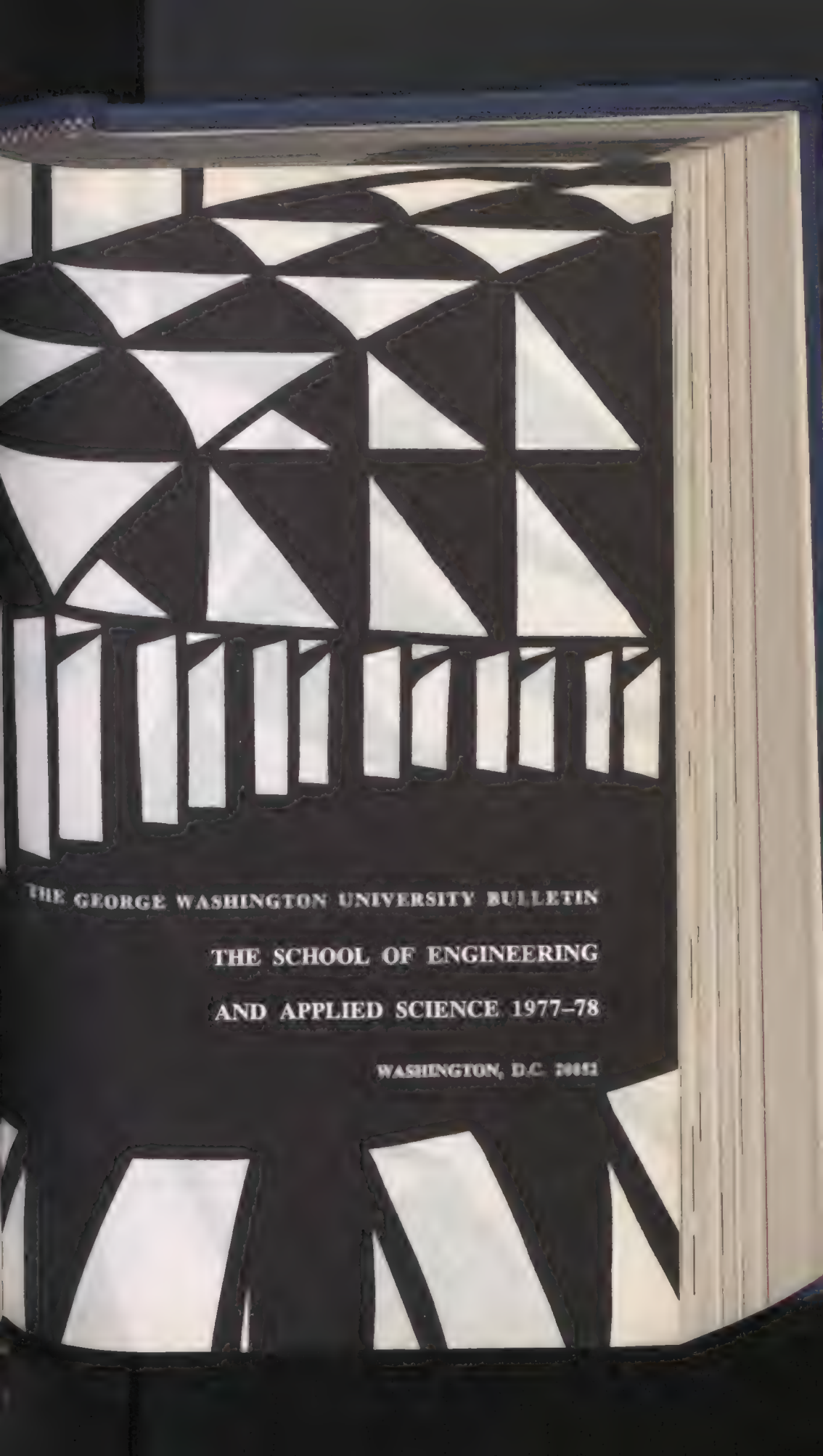


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THE GEORGE WASHINGTON UNIVERSITY BULLETIN

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE 1977–78

WASHINGTON, D.C. 20052



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THE CALENDAR 1977–78*

1977	FALL SEMESTER
August 29	Orientation for students from foreign countries *Monday*
August 30	Orientation and placement tests for entering students *Tuesday*
August 31	Advising for all students *Wednesday*
†*September 1–3*	Registration—Tompkins Hall of Engineering *Thursday–Saturday*
	Application for February graduation due as part of registration
September 5	Labor Day (holiday) *Monday*
September 6	Classes begin *Tuesday*
November 1	Application for spring semester financial aid due *Tuesday*
November 18	D.Sc. dissertations of February candidates due *Friday*
November 23	Thanksgiving recess begins after last class *Wednesday*
November 28	Classes resume *Monday*
December 1	Master's theses of February candidates due *Thursday*
December 6	Last day of fall semester classes *Tuesday*
December 12–21	Examination period *Monday–Wednesday*

1978	SPRING SEMESTER
January 9	Orientation for students from foreign countries *Monday*
January 10–11	Advising for all students—*Tuesday–Wednesday*
†*January 12–14*	Registration—Tompkins Hall of Engineering *Thursday–Saturday*
	Application for May graduation due as part of registration
January 16	Spring-semester classes begin *Monday*
February 1	Deadline for submission of 1978–79 freshman student financial aid applications *Wednesday*
February 20	Winter Convocation (holiday) *Monday*
March 1	Deadline for submission of 1978–79 continuing and transfer undergraduate student financial aid applications *Wednesday*
March 11	Spring recess begins after last class *Saturday*
March 20	Classes resume *Monday*
March 23	D.Sc. dissertations of May candidates due *Thursday*
April 1	Deadline for submission of Summer Sessions and 1978–79 graduate financial aid applications *Saturday*
April 7	Master's theses of May candidates due *Friday*
April 21	Last day of spring semester classes *Friday*
April 27–May 6	Examination period *Thursday–Saturday*
May 7	Commencement *Sunday*

* This calendar is subject to change.
† The registration procedure and hours of registration will be stated in the *Schedule of Classes* which is available well in advance of each semester.

1977

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TO ALL PROSPECTIVE STUDENTS:

The School of Engineering and Applied Science has been in continuous session since 1884, and offers programs of study leading to Bachelor's, Master's, Professional, and Doctor's degrees. Its prime objective is to develop in the student the precious asset of a well-trained mind which may be applied to the attainment of our many national objectives. In these changing times, it is necessary to search for quality. Students and faculty have the opportunity of assisting in the planning and implementation of educational programs. Examination is made periodically of the School's objectives and how they relate to those established by the Engineering Council for Professional Development (ECPD). Emphasis includes such items as the student's basic and advanced levels of education and role in present and future society.

This catalogue describes the programs and requirements for undergraduate and graduate study in the School of Engineering and Applied Science and includes information on the Cooperative Education Program in Engineering and the Joint Institute for Advancement of Flight Sciences (JIAFS).

The Cooperative Education Program in Engineering provides the undergraduate engineering student with the opportunity to obtain an enduring foundation in engineering education by combining academic learning with practical, first-hand experience in the student's chosen field of engineering. The student's earnings will help to pay for a major part of the cost of an engineering education.

JIAFS was created by the joint efforts of the NASA-Langley Research Center and the School of Engineering and Applied Science. The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research resources and facilities of NASA-Langley Research Center to prepare qualified graduate students for careers in research, development, design, and teaching.

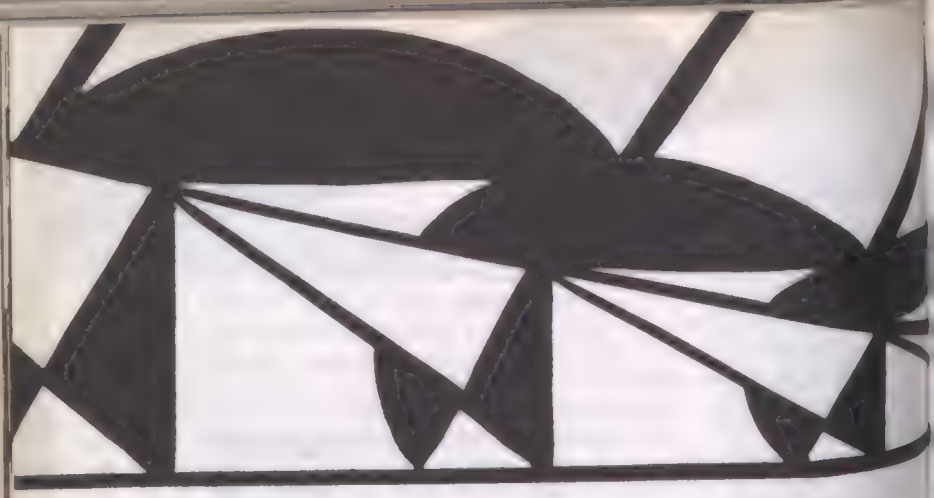
The School of Engineering and Applied Science is a professional school in a university comprised of eight degree-granting schools and colleges. The environment of the nation's capital is very favorable for the intellectual and cultural development of the student. The metropolitan Washington area contains the second largest concentration of research and development in the United States, and the engineering component of this activity is similarly extensive, offering many employment opportunities to students after graduation.

The atmosphere of the School is one of serious-minded effort toward mature development. Being a small school, it recognizes the individual as the single most important element in the educational process. The student body, undergraduate and graduate, has a primary interest in design, research, development, and management in both scientific and engineering activities. Many alumni of the School are successfully engaged in all fields of engineering—in science, management, government, and education.

The philosophy of the School, which might be summarized as "education for creativity, not conformity," has through the years reflected the many subtle and profound changes in the engineering profession.

The faculty of the School and I look forward to a closer and more fruitful relationship with you. If you need additional information, please do not hesitate to call upon the department chairmen or me.

HAROLD LIEBOWITZ
Dean



THE STUDY OF ENGINEERING

The Meaning of Engineering and Applied Science

THE RESPONSIBILITIES AND ACTIVITIES of the engineering profession extend into every aspect of industry and research and into many fields of commerce and the arts. Engineers face problems in the production and distribution of all types of manufactured products, including the design of mechanical, electrical, and chemical processes, of equipment, and of plants in which such products are made; in the design and construction of a variety of structures such as bridges, tunnels, harbors, and dams; in aircraft design and construction, including complicated electronic equipment for control, guidance, and communication; in the operation of transportation systems; in the wide spectrum of activities existing in the automotive industry; in the missile and space programs; in the generation and transmission of power; in the modern phases of communication; in the control of traffic; in city planning; in public health and sanitation as it affects the environment; in energy resources and power; and in ventilation and refrigeration. This list of applications is far from exhaustive; it does indicate, however, that engineering is a broad profession in which there are many specialists.

The Relationship of Engineering and Science

In any discussion of engineering and applied science, it is important to emphasize the distinction between engineering and science. The President's Scientific Advisory Committee points out that the engineer and scientist each play an important role on a team: "The scientist is one who seeks to extend the boundaries of knowledge in his chosen field. The engineer has the task of combining the knowledge of science with a knowledge and awareness of the needs and limitations of human beings and of a human society to develop and create things for human use. . . . While scientists have uncovered the basic knowledge, it is the engineers who have created the tangible tools, materials, and products that have revolutionized our daily lives, our community living, and our national defense."

The work of engineers is a focal point at which scientific knowledge, the use of such knowledge as a service to society, financial material, human resources, and society's needs are interrelated. The engineer is concerned, therefore, with the means for operating a dynamic society, and must consider not only whether the knowledge that exists will enable the creation of a workable product, but also how the product can be built, who will use it, and how such use will affect the environment in which it will operate.

The Professional Engineer

Engineers are concerned with the quality and preservation of human life. Engineer, as the term is used in this bulletin and as it is commonly understood in our society, refers to the person who makes use of the advances of science and technology in an economically feasible manner for the benefit of society. This process is complex and challenging. Although the content of engineering curricula is certainly scientific, the engineer has not lost a sense of purpose in serving as an intellectual agent in the practical world. This responsibility of the engineer arises from the breadth of the implications of engineering for the whole of society as well as from the depth of the requirements for competence. Technology has radically rearranged human life in our time. There are many who believe that, although the threshold of space has been crossed, the union of medical and engineering practice has been achieved, and breakthroughs have been made in other areas, this impact of engineering on modern life is just a modest preview of the engineering of tomorrow.

Engineering Education and the Student

Rapidly changing and advancing engineering activity requires an education for the future based on fundamental principles of science useful in applications to a dynamic, advanced society. In the fields of engineering and applied science there is no substitute for demonstrated ability and competence to solve the problems faced. Without question, achievement in particular courses of study is important. Equally important, however, is the ability to analyze and interpret all the aspects of a problem, to formulate solutions, and to evaluate those solutions in the light of all available information. The attainment of this objective is the basis for undergraduate education. The undergraduate program of the School of Engineering and Applied Science is subjected to periodic evaluation and appraisal by the faculty.

The curricula of the School of Engineering and Applied Science are founded on one basic principle—to assist the student in preparing for a career in engineering and applied science. This philosophy requires that the student master the principles on which future practice will be based. An education centered on that meaningful junction between theory and practice enables the engineer to follow the many interests and opportunities that may develop.

It should not be assumed, however, that only the intellectual elite should consider the study of engineering and applied science. Engineering, like medicine, law, education, science, history, government, and other disciplines, requires scholars. But in any of these areas, even though the prospective student has not achieved high scholastic standing, if there is genuine interest in the subject, a place can probably be found. Those with average mental ability who are interested and willing to work will find in engineering and applied

science a rich and varied field of study which can lead to satisfaction and success. It is difficult to make generalizations in this area, but students who have demonstrated an aptitude for mathematics, science, and English will probably find the work of engineers and the study of engineering and applied science satisfying and challenging. Innate intellectual curiosity and the desire to learn and to work hard are good indicators of success. College Board examinations may reveal the capacity to undertake further study in mathematics and science and their applications to engineering. No school or college can "give" an education. It can offer only the opportunity to "get" an education. The George Washington University's School of Engineering and Applied Science is a small school which provides an opportunity for close contact with faculty members as well as the opportunity to participate in student organizations, and in many other student activities. The School recognizes the individual as the most important element in the educational process.



THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE

History

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE was organized October 1, 1884, as the Corcoran Scientific School of Columbian University and was situated in the University Building then at 15th and H Streets, N.W. The School was named in honor of William W. Corcoran, Trustee and President of the Corporation from 1869 to 1888. Day and evening courses were offered in literature, science, and technology and led to the degrees of Bachelor of Science, Civil Engineer, Mechanical Engineer, and Mining Engineer. The School was among the first to accept women for degree candidacy in engineering.

In 1903 the Corcoran Scientific School, the School of Graduate Studies, and the Columbian College were merged into a single Department of Arts and Sciences. Graduate engineering degrees were offered.

Administrative changes led to The Washington College of Engineering being initiated in 1905 as one of the several semi-independent undergraduate colleges of the University, each with its own Board of Trustees. The College provided instruction leading to undergraduate degrees in engineering and architecture.

In 1909 the name of the College was changed to the College of Engineering and Mechanic Arts, and the curricula were revised to give the student a thorough understanding of the theory underlying engineering practice. Emphasis was placed on the development of a knowledge of scientific principles upon which the student could build and by which he might solve new problems as they are met in practice.

The name of the School was changed again in 1914 to the College of Engineering and later to the School of Engineering. Architecture was dropped from the curriculum, and degrees were limited to the field of engineering. However, the primary emphasis upon principles rather than technology which had characterized the School since 1903 was continued and has remained to this day as one of the important distinguishing features of the School.

In 1962 the name of the School became the School of Engineering and Applied Science.

Academic Status

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The undergraduate curricula in Civil Engineering, Electrical Engineering, and Mechanical Engineering are accredited by the Engineers' Council for Professional Development.

University Policy on Equal Opportunity

In accordance with the stated policy of its Board of Trustees and in conformity with federal laws and regulations, The George Washington University does not discriminate against any person on the bases of sex, race, color, religion, or national origin in any of its education or employment programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 call for an explicit statement that the requirement not to discriminate on the basis of sex extends to employment in and admission to such programs and activities.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office of Civil Rights of the Department of Health, Education, and Welfare.

Undergraduate Study

THE UNDERGRADUATE PROGRAM is intended to provide a solid foundation in the basic principles, concepts, and techniques underlying engineering and applied science, on which the individual may build technical competence in a variety of areas as his professional career develops. It is preparation for a career in engineering or applied science, as it exists today and as it may develop in the future.

Undergraduate study is the formal beginning of a life-long continuing program of education. The School provides an environment that encourages and fosters the attitudes and disciplines essential to professional growth. The graduate, when he receives his bachelor's degree, is prepared for productive work in his chosen field; he is also prepared for further development and progress, both formal and informal. The undergraduate curricula include courses in the humanities and social sciences to the extent necessary to develop a reasonable understanding and appreciation of these areas of knowledge.

Admission to the engineering program indicates that the student possesses at least minimum preparation and the probable capacity to meet the academic demands of this School. Since the School cannot predict either the student's response to the academic demands or the program to follow for the most effective development, the undergraduate program has been designed to offer a variety of experiences through which the student may find the best path to maturity and growth in educational development.

The School is a place for learning; for experiencing adventures of the mind and of the hands; for the formulation, exchange, and exploration of ideas. During his undergraduate years the student is led to strengthen his skills in analysis and his talent for creative activity, through liberal use of project-type laboratory work. Independent thought and original ideas receive higher evaluation, in the appraisal of student achievements, than the rote recital of information.

To provide the undergraduate engineering student with the opportunity to obtain an enduring foundation in engineering education by combining academic learning with relevant, real-world employment which provides practical, first-hand experience in engineering, the School of Engineering and Applied Science has a Cooperative Education Program in Engineering in which arrangements have been made with leading industrial and governmental organizations for student employment at prevailing salary rates. Every effort is made to place the student in positions of employment that provide the best possible engineering experience consistent with career plans. These work periods provide the student with income that may enable him to finance the major portion of his tuition and other expenses. Entering freshmen, as well as transfer students from community colleges whose completed work is equivalent to requirements in this program, can be admitted to the Cooperative Education Program in Engineering.

ADMISSION TO UNDERGRADUATE STUDY

The School admits those applicants who can benefit themselves and society by disciplined intellectual effort in its environment. In the selection process, there is no discrimination because of sex, race, color, religion, or national origin.

Admission is the first selective step in a long series of qualifying steps the student will take in his progress toward professional competence in engineering. It indicates the School's belief that the applicant has at least the minimum preparation and ability to complete the curriculum successfully.

The applicant must be of good character and must have an academic background appropriate for the program of studies contemplated.

Application for Admission

An applicant for admission obtains from the Office of Admissions of the University an application blank which he must fill out completely and return with the $10* application fee.

Students From U.S. Institutions

Records presented become the property of the University and *cannot* be returned.

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* Application fee must be by check or postal money order, payable to George Washington University. The application fee is waived for a student applying for readmission who was registered in a degree program at the time of the student's last registration at this University and who has not since registered at another institution.

FRESHMAN ADMISSION

Consideration for admission is based on the following:

1. An acceptable certificate of graduation from an accredited high school showing at least 15 units*;

2. The principal's statement that the applicant is prepared to undertake college work;

3. Scores on these two College Entrance Examination Board tests: the Scholastic Aptitude Test and the English Composition Achievement Test; or on the American College Test (ACT).

The qualifications of applicants who, because of unusual circumstances, do not meet the above requirements will be considered by the School, which may prescribe admission tests.

Nine and one-half of the 15 units required for entrance must be distributed as follows: three in English, two in algebra, one in plane geometry, one-half in plane trigonometry, one in physics or chemistry, and two in one foreign language or history. General science may *not* be counted in satisfaction of the science requirement but may be counted as an elective unit.

It is recommended that *both* physics and chemistry be studied in high school. A high school course in solid geometry is recommended as a firm foundation for college mathematics.

An applicant must arrange to have sent directly *from his school to the Office of Admissions* the academic record of his first seven terms in secondary school, together with a personal evaluation and recommendation from his principal. This information may be supplied on a form provided by the University or on a standard form used by the secondary school provided all essential information is included.

Quantitative Deficiency.—A graduate of an approved high school who lacks not more than two units of the required subjects and who presents 15 acceptable units may be admitted to a prescribed program which includes courses to make up his deficiencies.

Applicants who wish to begin study in the fall semester should formulate plans early in the senior high school year. Although the University prefers to have applications submitted during the fall semester of the senior high school year, applications may be submitted until May 1. Students graduating at midterm wishing to begin study in the spring semester *should* apply no later than December 1. Applications and all required credentials of students wishing to begin study in either the first or second term of the summer session must be received prior to March 1.

Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after September 1 to a student whose application becomes complete with a secondary school record through the junior year and junior-year test scores, provided these records clearly establish admissibility.

Early Admission Plan.—Unusually well-prepared students who have completed the junior year in high school may be considered for admission if they submit special credentials and have the unqualified recommendation of their principal or counselor. Inquiries should specifically mention the Early Admission Plan.

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* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods of prepared classroom work.

TRANSFER STUDENTS

Transfer students from other institutions (see page 22 for minimum residence requirement) should submit application and required credentials prior to June 1 for the fall semester, December 1 for the spring semester, April 1 for the summer sessions.

The transfer student must be in good standing as to scholarship and conduct. A student who has been suspended more than one time or academically dismissed will not normally be considered for admission.

An applicant who has attended one or more institutions of higher learning must request *each registrar* to mail directly *to the Office of Admissions of the University* a transcript of his or her record, *even though credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (*C* or better in academic courses from an accredited institution), at the time the application is submitted, the applicant must request that his or her high school record and College Examination Board or ACT test scores be sent to the Office of Admissions.

If high school units are not shown on the college transcript, the applicant must request that the high school record be sent to the Office of Admissions.

Students from Foreign Institutions

Application, required records, and scores on the *Test of English as a Foreign Language* (see below) must be received from *all international applicants* no later than May 1 for the fall semester and November 15 for the spring semester.

REQUIRED RECORDS

At the time the application is sent, the applicant must request the educational institution previously attended to send directly to the Office of Admissions copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies which are sent should be accompanied by an English translation.

LANGUAGE TEST

Students whose native tongue is not English should take the TOEFL test (Test of English as a Foreign Language) or the ALIGU test (American Language Institute, Georgetown University). Students are responsible for making arrangements for taking these tests. Foreign students abroad should consult with the nearest U.S. Embassy for information on arrangements for taking ALIGU. Those interested in TOEFL should address inquiries to the following agencies:

1. All European countries (including Cyprus, Great Britain, Iceland, and Ireland): CITO
   Postbus 1034
   Arnhem, The Netherlands

2. All Middle Eastern and North African countries (except Israel):
   American Friends of the Middle East
   Abou Shakra Building
   Rue Bliss (Manara)
   Beirut, 2500 Lebanon
3. Hong Kong:
   Institute of International Education
   408 J. Hotung House, Fourth Floor
   5/15 Hankow Road, Kowloon, Hong Kong
4. India:
   Bureau of Educational Research
   Ewing Christian College
   Allahabad, U.P., 211003, India
5. Republic of China:
   Language Center, 2-1 Hsu-chow Road
   Taipei, Taiwan (100), Republic of China

All other applicants should address inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08540, U.S.A. The completed application form should be returned to the appropriate agency well in advance of the beginning of the semester for which the applicant seeks admission. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* or the ALIGU test does not constitute application for admission to George Washington University.

The TOEFL Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the appropriate admissions office at this University (see "Undergraduate Admission," pages 13–15, or "Graduate Admission," page 25).

In addition to the TOEFL or ALIGU tests an admitted student may be required to take a test in English as a Second Language prior to registration. Results of this test will determine the courses the student will be permitted to register for in the program of study. If the knowledge of English is inadequate to enable the student to undertake any academic work, the student will not be permitted to register for any courses other than English and will be required to study English on a full-time basis either at this University or at a recognized language institution.

International students in the U.S. may take a locally administered George Washington University English placement test in lieu of the ALIGU or TOEFL test. Arrangements for this test may be made by contacting:

Dr. George Bozzini, Director
English for International Students
George Washington University
Washington, D.C. 20052

and making an appointment. A $10 fee is required for this examination.

SPECIAL ENGLISH COURSES FOR INTERNATIONAL STUDENTS

The extensive experience of the Department of English with the language needs

of international students has been synthesized into a comprehensive English Language Program that includes the following courses:

English 1: English for International Students (0)

An intensive, elementary-level course, which meets 15 class hours and 5 monitored laboratory hours per week. The objectives of the course are to introduce the student to grammatical structure through oral drill and practice; to develop a basic working vocabulary; to develop fluency; to enable the student to read and write all the patterns he or she has mastered orally; to orient the student to the cultures of the English-speaking peoples.

English 2: English for International Students (0)

An intensive, lower-intermediate-level course, which meets 15 class hours and 5 monitored laboratory hours per week. The objectives of the course are to strengthen ability to use basic grammatical structures appropriately and to introduce increasingly complex structures; to build reading skills and to expand vocabulary with the use of specially adapted materials; to introduce the student to unadapted reading materials, such as newspapers; to focus on writing sentences and paragraphs; to continue cultural orientation; and to foster multicultural sharing among international students.

English 3: English for International Students (3)

A semi-intensive, intermediate-level course, which meets 10 class hours and 5 laboratory hours per week. This course deals with complex grammatical structures, reading skills, vocabulary, and oral expression.

English 4: English for International Students (3)

A higher-intermediate-level course, which meets 10 class hours and 3 laboratory hours per week. The objectives of the course are to provide a comprehensive review of grammatical structure, including clauses; to expand vocabulary further through use of unadapted reading material; to increase reading speed and comprehension; to encourage oral expression of ideas encountered in the student's reading material. The course also includes instruction in composition which focuses on outlining and the writing of paragraphs.

English 5: English Composition for International Students (3)

An advanced-level composition course for students showing a high degree of academic proficiency in English. The aim of the course is to develop writing skills and to foster an understanding of exposition techniques. The course requires a writing assignment each week and a 10–20-page research paper. For the latter project, the student is introduced to library research methods. The course meets 4 class hours per week and also includes extensive individual counseling outside the classroom.

English 7: English Composition for International Students (3)

A more advanced composition course, following English 5, for undergraduates not yet ready to take English 11 or 12 and for graduate students in need of further writing practice. The course requires weekly reading and writing assignments and a research paper. Students are expected to be familiar with expository techniques and library research methods taught in English 5. The course meets 4 hours per week.

The language laboratory is available to all students in the English Language

Program. The laboratory contains a library of tapes that accompany the printed texts and a variety of listening and recording equipment, including individual recording and playback equipment.

Admission to a particular English class is determined by a suitable series of objective and nonobjective tests.

The English Language Program is administered by the College of General Studies and is offered in cooperation with the Department of English, Professor J.P. Reesing, Jr., Chairman. The English for International Students Program is under the direction of Dr. George Bozzini.

Readmission

A student previously registered in the University who was not registered on campus during the immediately preceding semester (summer session excluded) must apply for readmission. Final dates for applying are the same as those for "Undergraduate Admission" (see page 14), or "Graduate Admission" (see page 25). If the student applies as a degree candidate and was previously registered as a nondegree student, or if a student has attended one or more higher institutions while absent from the University, the student must have complete, official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for a student applying for readmission who was a degree candidate at the time the student last registered at this University and who has not since registered at another institution.

Advanced Tuition Deposit

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students including those readmitted. The deposit is due May 1 for students entering in the fall semester, and is due December 15 for students entering in the spring semester. The deposit is credited toward tuition and is not refundable.

Advanced Standing

CREDIT BY EXAMINATION

Assuming there is no duplication of course work earned, a maximum of 30 semester hours of credit may be assigned upon admission to the University for each or any combination of the following:

College Entrance Examination Board Advanced Placement Tests (APT).—Credit is assigned for examinations passed with scores of 4 or 5 on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. Examinations passed with scores of 3 will be considered for credit or placement if the student arranges to have the examination paper sent to the Office of Admissions. The Advanced Placement Tests are administered in the secondary school in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Entrance Examination Board, Advanced Placement Tests, Box 592, Princeton, N.J. 08540, or Box 1025, Berkeley, Calif. 94701.

College Entrance Examination Board College-level Examination Program (CLEP).—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, the student is assigned credit for the General Examinations, with the exception of the English composition examination, passed at the 50th percentile or above (college sophomore norms). Credit is assigned for the Subject Examinations passed at the level recommended in the College Board model policy. A candidate for a degree from any school at this University must seek departmental approval *prior* to taking the examination to receive credit for a CLEP Subject Examination. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-level Examination Program, Box 1824, Princeton, N.J. 08540.

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through course work or examination, advanced standing may be granted for work successfully completed at accredited institutions of higher learning. It will be granted only when it meets the requirements for the degree sought at this University and may be accepted provisionally. Work of low pass grade (*D* or the equivalent) will not be considered for transfer.

Although there is no strict limit to the total amount of transfer credit that may be assigned, a student must satisfy the residence and course requirements for the degree sought at George Washington University.

CREDIT FROM TECHNICAL INSTITUTES

Advanced standing may be granted for work successfully completed at technical institutes. Credit will be granted for transferred work only when the applicant passes successfully the required validation examination. Arrangement for the examination should be made with the appropriate department of the School. In any event, no more than 30 semester hours of credit for technical work will be granted in transfer for those who graduated from a two-year technical institute. A maximum of 60 semester hours of credit for technical work may be granted in transfer for those who graduated from a four-year technical institute.

CREDIT FROM SERVICE SCHOOLS

A limited amount of credit may be assigned for selected service school instruction received since 1941. No more than 30 semester hours may be assigned for a combination of service schools and examinations referred to above. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces.*

CREDIT EARNED THROUGH UNITED STATES ARMED FORCES INSTITUTE (USAFI)

Credit is assigned for approved United States Armed Forces Institute college-level examinations passed with satisfactory scores.

REGULATIONS

Regulations regarding REGISTRATION, FEES, AND FINANCES *are stated on pages 184–89; other University regulations, on pages 193–98.*

Attendance

A student may not attend classes until registration is completed and fees due are paid. He may attend only those classes for which he is registered. Regular attendance is required. A student may be dropped from any course for undue absence.

The student is expected to attend every meeting of the course in which he is registered, fully prepared to carry on the work required. The student is held responsible for all work in the course, and all absences must be excused before provision will be made for him to make up the work missed. Excuses for absences from examinations which have been announced in advance can be obtained only by written application to the instructor in charge of the course.

Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 20 semester hours. A student employed more than 24 hours a week who is not on probation may take no more than 10 semester hours. In exceptional cases these limits may be exceeded with the Dean's permission.

Advisory System

The School of Engineering and Applied Science encourages a close faculty-student relationship. Every entering undergraduate student is assigned a permanent faculty adviser to assist him in orienting himself in the professional discipline. Faculty advisers counsel students on their programs of study, the achievement and maintenance of satisfactory scholastic performances, professional development, and extracurricular activity as part of the educational process. The adviser represents the student in all cases requiring faculty action.

Students must obtain their advisers' approval of programs of study prior to registration. Until a student has completed the work required for the degree he must consult his adviser in all academic matters. However, an adviser may not deny a student entry into any course or activity to which he is entitled under the regulations of the School.

All students are encouraged to discuss college problems with their advisers or instructors at any time, and parents or guardians are invited to consult with the Dean, Department Chairman, and advisers concerning any student problems.

Faculty advisers discharge their counseling duties in accordance with the high principles of their professional responsibility; however, the final responsibility for a student's action lies wholly with the student.

Scholarship

For scholarship requirements for graduation, see "Graduation Requirements," page 22.

Grades.—Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail. Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) or the symbol *F* (Unauthorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond his control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change. Although the grade of *I may* remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work (usually the final examination or required paper) must be made up. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere. An *I* cannot be made up after the lapse of one calendar year.

Quality-point Index.—Scholarship is computed in terms of the quality-point index obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point, *F*, no points, for each semester hour for which the student registered. Courses marked *W* or *I* are not considered in determining the index, except that courses marked *I* will be considered when a formal grade is recorded. Grades in courses at another institution are not considered in computing the quality-point index.

Mid-semester Warning.—At the end of the seventh week of each semester, instructors report to the Dean the names of students whose scholarship is unsatisfactory. On receipt of a warning notice the student must consult the instructor and adviser immediately.

The adviser may prescribe diagnostic tests and/or remedial study to be completed before the end of the current semester.

Probation.—A full-time student (one taking 12 semester hours or more) whose quality-point index based on all courses attempted in his most recent semester falls below 2.00 for that semester, or who receives two grades or more of *F* in one semester, will be placed on probation. A student enrolled for less than 12 semester hours during the fall or spring semester and a student enrolled during the summer sessions is subject to probation or suspension on the basis of his record for 12 semester hours, rather than on his record in any one semester. The probation period is for one semester for full-time students, or the next 12 semester hours of study for part-time students.

To be removed from probational status, a student must earn a quality-point

index of at least 2.00 in all courses taken during the period of probation and receive no grade of *F* during this period.

A student who fails to achieve a quality-point index of 2.00 for all courses completed during the probation period is continued on probation for an additional period of one semester or 12 semester hours of study.

Upon being placed on probation, a student must undertake the Engineering Student Probation Program of testing, counseling, and remedial work available at the Counseling Center. A student on probation is required to follow a program of study prescribed by his adviser and Department Chairman, and is cautioned not to take more than 12 semester hours of study. The student is not eligible to participate in student activities.

Suspension.—If a student receives two or more grades of *F* during a probation period he will be suspended. If a student fails to achieve a quality-point index of 2.00 in a second consecutive period of probation, he will be suspended. A student who has been on probation for three periods and who fails to achieve a quality-point index of 2.00 in the third period or any subsequent semester will be suspended.

DEAN'S HONORS LIST

The Faculty of the School recognizes meritorious scholastic achievement by a Dean's Honors List, containing the names of candidates for undergraduate degrees whose scholastic achievement satisfies all of the following requirements:

1. The student must have completed a minimum of 13 semester hours in one semester with a quality-point index of 3.00 or higher and with no more than one grade of *C*.
2. No grade below *C* may have been received during the qualifying period.
3. No disciplinary action may have been taken with respect to the student.

The Dean's Honors List is prepared at the end of the fall and spring semesters and displayed in an appropriate public place in the School. A notation is made on the student's record each time his name is included in the List.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the Dean. The Dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the Dean.

Graduation Requirements

See page 196 for general requirements for graduation.

RESIDENCE

A minimum of 30 semester hours must be completed in residence. Summer work may be counted. Unless special permission is granted by the Dean to study elsewhere, the work of the final year must be completed in residence.

SCHOLARSHIP

To be eligible for graduation a student must have a quality-point index of at least 2.20 in those technical courses specified in the fifth through the eighth semester of the curriculum.

HONORS

With Distinction.—A Bachelor's degree may be conferred "With Distinction," at the discretion of the Faculty, if a student attains a quality-point index of 3.50 or higher on all work taken at this institution. To be eligible for this honor a student must have completed at this institution at least one-half of the work required for the degree.

Special Honors.—A Bachelor's degree may be conferred with "Special Honors," at the discretion of the Faculty, for outstanding achievement in the student's senior year work on recommendation of the Faculty, under the following regulations:

1. The student must have candidacy for Special Honors approved by the department chairman representing the major field not later than the beginning of the senior year.
2. The student must meet such other conditions as may be set at the time candidacy is approved.
3. No student will be awarded Special Honors unless a quality-point index of at least 3.00 is achieved on all work taken at this institution.
4. To be eligible for Special Honors a student must have completed at this institution at least one-half of the work required for the degree.

UNDERGRADUATE CURRICULA

The four-year undergraduate curricula lead to the degree of Bachelor of Science, with parenthetic designation of the major; for example, Bachelor of Science (Electrical Engineering). Students who are deficient in preparation require a longer period; those who are admitted with advanced standing or who attend summer sessions can complete the requirements in less time.

The program of the first four semesters (2 years) is common to all curricula and provides the essential broad base of scientific principles and mathematical techniques necessary for the professional courses of the last four semesters, together with an appropriate background in the humanities and social sciences (see below).

A minimum total of 130 semester hours is required to qualify for the degree. Certain options may require more than the minimum. However, students are encouraged to elect additional course work above the required minimum to the extent that their interests and the School's offerings permit.

Degrees are offered in Civil Engineering, Electrical Engineering, and Mechanical Engineering. Students in Civil Engineering may select options in Computer-oriented, Environmental-oriented, and Geotechnical Civil Engineering; students in Mechanical Engineering may select options in Energy, Resources, and Power-oriented and Computer-oriented Mechanical Engineering. Electrical Engineering provides options in Computer Science and Premedical Engineering.

The student is assisted by a faculty adviser, who approves the program each semester prior to registration. For the guidance of the student and the adviser,

every beginning student takes the School's placement examinations in English, reading, algebra, and trigonometry and, if deficient in any of these areas, must take remedial work in the area of deficiency.

Courses in the Humanities and Social Sciences

The program in the humanities and social sciences for engineering students assists them in acquiring knowledge which will permit an understanding of the social and humanistic elements of the past and present and an analysis of problems facing society today. The ultimate goal is to help the engineer have a better understanding of society and an appreciation of the engineer's role and responsibilities within it.

Since the education of an engineering student is, by necessity, oriented toward technical subjects, the program in the humanities and social sciences should not emphasize technical aspects and skills, but should rather consist of courses which broaden the outlook. As a consequence, courses in subjects such as accounting, finance, industrial management, introductory languages, and personnel administration should not be included in the humanities and social sciences program. On the other hand, courses in areas such as anthropology, economics, fine arts, geography, history, literature, philosophy, political science, psychology, and sociology are considered appropriate.

Each engineering student is required to prepare, with the assistance of the faculty adviser, a program of courses in the humanities and social sciences, explaining how the program meets the purpose stated above. The student's program must include a minimum of 18 semester hours and must be approved by both the adviser and department chairman.

Graduate Study

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE offers graduate study leading to the degrees of Master of Science, Master of Engineering Administration and Doctor of Science, and to the Professional degrees of Engineer and Applied Scientist.

In its graduate programs, the School, as it does in undergraduate study, adheres to the educational philosophy of increasing the knowledge and understanding of the individual student by concentration on principles and their application rather than by encyclopedic coverage of techniques and specialized detail. Each program is individually planned according to the student's preparation and needs.

Graduate study may be undertaken in any field of engineering or applied science in which the School has adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives. A complete list of available fields and areas of concentration is included under each departmental listing in the "Programs of Study and Courses of Instruction" section of this catalogue beginning on page 49.

THE MASTER'S PROGRAMS

The student's program may provide for broad coverage in a variety of fields or may be designed to provide a concentration in particular areas. The minimum program consists of 24 semester hours of approved graduate courses and a Master's thesis (equivalent to 6 semester hours). With the approval of the department the student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses. All Master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Upon admission the student is assigned an adviser. Programs of study are determined by any prerequisites established and the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's adviser and the appropriate department chairman.

Admission

Admission to graduate study toward a Master's degree requires an appropriate Bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, as indicated by undergraduate grades, Graduate Record Examination scores, and similar data.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to graduate student status. In some cases, if such deficiencies are minimal, he may be admitted to graduate student status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he is deficient. In no case may the undergraduate courses thus taken fulfill any part of the requirements for the Master's degree.

For additional admissions requirements for the degrees of Master of Engineering Administration and Master of Science in the Department of Engineering Administration, see pages 152 and 157; for the degree of Master of Science in the Department of Operations Research, see page 170. Candidates for the degree of Master of Science in the Department of Electrical Engineering and Computer Science must have satisfied specific undergraduate requirements, depending upon the area of concentration. Students should consult the special brochure *The Graduate Programs of the Department of Electrical Engineering and Computer Science.*

ADMISSION PROCEDURE

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted, together with the nonrefundable application fee of $25, to the Manager of Engineering Admissions, Room 100, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 1 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, and June 1 for the second summer session. The applicant must request each educational institution attended since high school graduation to send an official transcript of his record directly to the Manager of Engineering Admissions. Although not re-

quired, if the applicant has completed the Graduate Record Examination, he should request that his scores be sent to the School. The applicant will be notified by mail when a decision on his admission has been made. English language requirements for international students are contained on pages 15–18.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

TRANSFER CREDIT

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*), which normally must have been earned in a graduate program at another recognized institution, *may* be accepted in transfer, when applicable, to satisfy Master's degree requirements in this School. However, the student must, with the approval of his adviser, petition to the appropriate department chairman for such a transfer.

Registration

A graduate student may register for classes when he presents an official letter of admission or Student Identification Card from the previous semester. No registration is accepted for less than a semester or one summer session.

Concurrent registration in this School and in another institution not a member of the Consortium of Universities of the Washington Metropolitan Area, Inc., or another division of this University requires the written permission of the Deans concerned, *prior to registration*. Allowance of credit for work done concurrently at another institution is at the discretion of the Dean.

Dates and hours of registration are stated in the Calendar, page 4, and in the *Schedule of Classes* published in advance of each semester.

Master's Thesis

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate his ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate that he can communicate the results of his work in writing. Work of a suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

As a part of registration for the thesis course 299, the candidate must submit to the appropriate department chairman (on the form obtainable at the School office) his thesis area, approved by his faculty adviser. He must submit his thesis title to the Dean, on the form available in the School office, at the beginning of the semester in which he expects to graduate. Registration in thesis 299–300 entitles the student, during such registration, to the advice of the member of the faculty under whom the thesis is to be written. He may consult his adviser, but the thesis is the exclusive responsibility of the student.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis 300. In case a thesis is unfinished on the date specified, the student will be granted an additional semester and must pay the "Continu-

ous Registration" fee (see page 185) unless he is registered for course work. If the preparation of the thesis extends beyond the three semesters, approval for an extension of time will be required and the student must reregister for thesis 300 and pay tuition as for a repeated course. The overall time limit for earning the degree (see page 28) may not be exceeded.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the School. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

Optional Master's Program without a Thesis

With the approval of the department, a student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses.

Master's Comprehensive Examination

The student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of his interest. This Examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on his first attempt may be examined one more time if approval is given by the appropriate Examining Committee. In the event of failure to complete the Examination satisfactorily, the student's graduate status terminates.

Regulations

Regulations regarding REGISTRATION, FEES, AND FINANCES *are stated on pages 184–89; other University regulations, on pages 193-98.*

ATTENDANCE

Students may not attend classes until registration is completed and fees due are paid. They may attend only those classes for which they are registered. Students are expected to attend every meeting of the course in which they are registered, fully prepared to carry on the work required. Students may be dropped from any course for undue absence.

SCHOLARSHIP

Grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; and *CR*, Credit for satisfactory thesis completion. Whenever a grade is not assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) is recorded.

Pass-Fail Grading System.—All SEAS students who have a keen desire to

advance their knowledge may take SEAS courses under the pass-fail grading system on the basis that the courses cannot be used toward any degree program at SEAS.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, he may initiate an appropriate grade change. Although the grade of *I* *may* remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere. An incomplete which is not removed within one calendar year is automatically changed to an *F*.

A student may not repeat for credit a course in which the student has received a grade of *C* or above, unless required to do so by the department concerned. A written statement requiring the student to repeat such a course for credit must be submitted to the Registrar by the appropriate department chairman.

Non-thesis Option.—A student may graduate with either:

1. 33 course credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or

2. A 3.00 quality-point index with a minimum of 33 course credit hours with no more than two grades below *B* of which only one *F* is permitted.

Thesis Option.—In addition to 6 credit hours of acceptable thesis, a student may graduate with either:

1. 24 course credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or

2. A 3.00 quality-point index with a minimum of 24 course credit hours with no more than two grades below *B* of which only one *F* is permitted.

Quality-point Index.—Scholastic standing is computed in terms of the quality-point index obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *F*, no points, for each semester hour for which the student registered. Courses marked *W* or *I* are not considered in determining the index, except that courses marked *I* will be considered when a formal grade is recorded. Grades in courses at another institution are not considered in computing the quality-point index.

RESIDENCE

In general, a minimum of one year of full-time study, or the equivalent in part-time study, must be completed in the School.

TIME TO COMPLETE MASTER'S DEGREE REQUIREMENTS

A full-time student in the Master's program is allowed a maximum of three

calendar years to complete all degree requirements, from the date of the student's first graduate-student status registration in prerequisite or graduate courses. A part-time student in the Master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Readmission is required upon expiration of leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman and approved by the Dean.

PROFESSIONAL DEGREE PROGRAM

The School of Engineering and Applied Science has established the Professional degree program to provide an educational program for those students who are interested in pursuing course work beyond the Master's degree, with emphasis on applied subject material rather than on basic research.

Successful completion of the Professional degree program leads to the degree of Engineer or degree of Applied Scientist.

In the Professional degree program, the School adheres to the educational philosophy of increasing the knowledge and understanding of the individual by concentration on principles and their application. This approach should provide the students with a technical flexibility to enable them to adapt successfully to rapidly changing technology. Each program is individually planned according to the student's background and needs and is subject to departmental requirements.

The Professional degree program has been designed to satisfy the needs of industry and government for highly trained and educated technical personnel in engineering and applied science.

Professional Degree Study Programs

The Professional degree program provides graduate study in those fields of engineering or applied science in which the School has adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives.

The student's program may provide for broad coverage in a variety of fields or may be designed to provide a concentration in particular areas. The minimum program consists of 30 semester hours of approved graduate courses beyond a Master's degree. Students whose graduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Admission

Admission to graduate study toward the Professional degree requires an appropriate Master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience.

REQUIREMENTS

1. *Engineer.*—To study toward the degree of Engineer, an applicant must possess a Master's degree and a bachelor's degree in the area of engineering.

2. *Applied Scientist.*—To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in either engineering, mathematics, or natural science; and a Master's degree in either engineering, natural science, mathematics, or administration. Applicants having an equivalent quantitative background could be considered as special cases by the respective departments.

Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

ADMISSION PROCEDURE

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted, together with the nonrefundable application fee of $25, to the Manager of Engineering Admissions, Room 100, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 15 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, and June 1 for the second summer session. The applicant must request each educational institution attended since high school graduation to send an official transcript of his record directly to the Manager of Engineering Admissions. The applicant will be notified by mail when a decision on his admission has been made.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

TRANSFER CREDIT

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*) beyond the Master's program, which must be earned within five years of the start of study toward the Professional degree may be accepted in transfer when applicable to satisfy Professional degree requirements in this School. However, the student must, with the approval of the adviser, petition to the appropriate department chairman for such a transfer.

Program of Study

Upon admission the student is assigned an adviser. Programs are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of studies for each candidate for the Professional degree must be approved by the student's adviser and the appropriate department chairman.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate and graduate courses before being admitted to Professional degree candidate status. In no case may these courses thus taken fulfill any part of the requirements for the Professional degree.

Each individual department may require the degree candidate to undertake and defend the results of a technical design project, development problem, or the preparation of a comprehensive technical report to demonstrate the candidate's ability to make independent use of the knowledge and discipline of

thought acquired and developed by graduate study. When applicable, the student will be informed of this requirement by the faculty adviser at the time the student's program is being formulated.

In no case, however, will this project be more than 6 credit hours out of a minimum of 30 credit hours.

Scholarship

No student studying for the Professional degree may receive more than two course grades below *B*. If more than two course grades below *B* are received, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of 3.00 to receive the degree.

Time to Complete Professional Degree Requirements

A full-time student in the Professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the first graduate-student status registration in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Readmission is required upon expiration of leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman.

Interrelationship with the Doctoral Program

Candidates for the D.Sc. degree or Professional degree who are in good academic standing may, with the approval of the faculty adviser and department chairman, transfer from one degree program to the other, if they meet necessary qualifications and requirements as specified by the appropriate department.

Residence and Continuous Study

All work for the degree must be done in residence (on the campus) except when special permission is granted by the chairman of the department. The student must maintain continuous registration in the School. Failure to do so breaks the student's registration and he must apply for readmission to the Professional degree program under whatever conditions and regulations are in effect at that time.

THE DOCTORAL PROGRAM

The School of Engineering and Applied Science offers a program of advanced study and research leading to the degree of Doctor of Science. This program is limited to those fields in engineering or applied science in which a discipline has been established and for which the University has or can arrange adequate resources.

The doctoral program is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. It requires study of interrelated fields of learning as well as original research in the field of central interest.

The program for the degree is divided into two stages. The first—made up of a study of interrelated fields of learning which supports the general area of research concentration—culminates in the qualifying examination. The second—composed of research investigation of a particular subject in a special field and the presentation of such research findings in a written dissertation—culminates in the final examination.

Admission to Doctoral Study

A satisfactory Master's degree from an accredited institution is required, together with acceptable personal qualities and a capacity for creative scholarship. Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

APPLICATION FOR ADMISSION

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted, together with a nonrefundable application fee of $25, to the Manager of Engineering Admissions, Room 100, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052. The prospective doctoral student seeking admission should apply before June 1 for the fall semester and before December 1 for the spring semester. Personal interviews may then be arranged to discuss the applicant's qualifications and the possibilities for an effective doctoral program. The applicant must arrange for complete documentary records (transcripts) to be forwarded to the Manager of Engineering Admissions in sufficient time to permit assembly of complete records for evaluation as soon after the above application deadlines as possible.

The applicant must arrange for letters of recommendation to be submitted from two faculty members of the institution from which he received his Master's degree; one of these, if possible, should be from his Master's adviser. The letters should be addressed to the appropriate department chairman.

Language Requirement

A doctoral student should maintain a broad outlook as he pursues his study and therefore must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language, preferably Russian, must be demonstrated before admission to the qualifying examination. If the student wishes to satisfy this requirement with a language other than Russian, he must obtain the approval first of his doctoral adviser, then of his department chairman; permission to use a language other than Russian will be granted on the basis of its importance to the student's field of interest.

Tool Requirement

In addition to the language requirement, an examination in a tool requirement (*e.g.*, computer programming) may be established by the various departments

Study for the Qualifying Examination

Upon admission to the first stage of the program, i.e., study of interrelated fields culminating in the qualifying examination, the student is assigned a faculty adviser who directs his studies.* The adviser approves appropriate fields of study to insure the student's breadth of knowledge and to support research in his central field of interest, advises him concerning the scope and content of his fields of study, and guides him in preparing for the qualifying examination. Programs of study are normally structured to include a major field of study and two minor or supporting fields.

A minimum of 30 semester hours of credit in a formal program at the graduate level beyond Master's study is required. In many cases, particularly when the student undertakes a doctoral program in a field other than that in which the student obtained the Master's degree, the program of studies exceeds 30 semester hours.

Students admitted to doctoral study are encouraged to undertake one year of full-time study on campus. In general, the adviser will require the student to register for a minimum of 6 semester hours of course work in every semester except the summer sessions.

Transfer of Credit

Up to 6 semester hours of credit earned in courses completed with the grade of *A* or *B* while enrolled in a doctoral program at another accredited institution may be accepted in transfer to satisfy doctoral requirements of this School, subject to the approval of the student's adviser and the department chairman. Credit earned in courses completed more than five years prior to admission to the doctoral program will not be accepted in transfer, and some departments may require that transfer credit must have been earned within a shorter period of time before admission.

The Qualifying Examination†

The purpose of the qualifying examination is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the central field. Qualifying examinations may be written or oral, or both, and are scheduled over a period of several days. They are conducted only during the fall and spring semesters on dates established by the departments and are administered by a faculty committee. Upon favorable report of the examiners to the Dean through the appropriate department chairman, the student is admitted to candidacy for the degree; the student then begins specialized study and research under the supervision of a designated member of the faculty or, in special instances, an outstanding engineer/scientist who is not a member of the faculty.

The qualifying examination is the principal means used to determine the student's ability to qualify as a candidate for the doctoral degree and to enter the second stage of the program.

At the discretion of the committee which prepared the examination, the doc-

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* In some departments, instead of a faculty adviser, a faculty committee may be appointed to supervise programs, direct study, and carry out all other responsibilities of the faculty adviser.

† Some departments may administer a pre-qualifying examination prior to completion of the study program.

toral student may be given a second opportunity to qualify for candidacy in the event of failure in any part of the qualifying examination. In general, the entire qualifying examination must be retaken by the student in order to qualify for candidacy.

Scholarship

To be admitted to the qualifying examination, the doctoral student must achieve an overall academic average of 3.20 on a scale of 4 (a grade of *A* equals 4 points; *B*, 3 points; *C*, 2 points; and *F*, 0 points). No doctoral student may receive more than two course grades below *B*. If the student does receive more than two course grades below *B*, the graduate study is terminated and further enrollment is prohibited. Courses in which the student earns grades below *B* are not included in the total semester-hour requirement for the degree. A student who receives any grade below *B* is required to consult with the adviser for a review of the student's program of study and discussion of possible changes therein.

Research, Dissertation, Final Examination

The student admitted to candidacy for the degree of Doctor of Science requests as Director of Research the member of the faculty under whom the student wishes to conduct research. The faculty member may accept or reject such request. The research area is approved by the Director. Throughout the remainder of the doctoral program the candidate conducts dissertation research directly under the Director. However, the student is not precluded from consulting with other members of the faculty, as may be required, on an informal basis, and may be encouraged to do so by the Director of Research. A committee of the faculty consisting of three members including the Director as chairman will advise in the final preparation of the dissertation. The department chairman appoints such a committee on the recommendation of the Director of Research. Work on the dissertation is equivalent to a minimum of 24 semester hours.

THE DISSERTATION

A dissertation is required as evidence of ability to perform original scholarly research and to present and interpret the results. The student is solely responsible for the content of the dissertation.

The aim of the student in this stage of his candidacy is the production of a dissertation which embodies the results of an extended original study and which includes material deemed worthy of publication in recognized scientific and engineering journals. The student is expected to attempt to publish the results of the research as soon as possible after the student receives the degree and to submit copies of the published material to the Dean. Credit must be given in the publication to the fact that the material is abstracted, summarized, developed, etc., from a dissertation submitted to George Washington University in partial fulfillment of the requirements for the Doctor of Science degree.

The candidate must submit to the appropriate department five complete copies of the dissertation and an abstract (not to exceed 600 words) of the dissertation no later than the date specified in the calendar. The abstract is included in the announcement of the examination and is reproduced by University Mi-

crofilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available at the School Office. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover a part of the expense of printing the abstract of his dissertation, and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the University Library, where bound copies are available for circulation.

THE FINAL EXAMINATION

Upon acceptance of the dissertation by the committee, consisting of the Director and two other faculty members of this School, which has assisted in supervising its final preparation, the candidate is presented for his final examination. The final examination is oral and is open to the public. The candidate must demonstrate a mastery of his special fields of study and of the materials and techniques used in the research. The committee of examiners will consist of not less than five members, three of whom must be members of the faculty on full-time service. The committee may include qualified experts brought to the University especially to participate in the examination. The Director of Research serves as Advocate for the candidate. When the candidate satisfies the examining committee of the high quality and originality of the candidate's contribution to knowledge as well as the mastery of the scholarship and research techniques of the field, the committee of examiners recommends the candidate for the degree of Doctor of Science. The final examination is conducted only during the fall and spring semesters. The candidate should consult with the appropriate department chairman as to possible dates for the examination.

Residence and Continuous Study

All the work for the degree must be done in residence (on the campus), except when special permission is granted by the chairman of the department. The student must maintain continuous registration in the School. Failure to do so breaks the registration, and the student must apply for readmission to doctoral study under whatever conditions and regulations are in effect at that time. In case of incapacity or other legitimate reasons, the student may be granted a leave of absence of up to one year. Extension of such leave will require special request to and approval of the appropriate department chairman. During approved leave of absence, the student must maintain continuous registration. The time period for completion of all requirements for the degree will be adjusted on the basis of the approved leave of absence.

In general, one year of study is the minimum amount of time to be spent in preparation for the qualifying examination. The qualifying examination must be completed within five years of the date of admission, and the entire degree program must be completed within seven years. After admission the student may apply for the qualifying examination whenever the student feels properly prepared. A minimum of two years of full-time study and research should be expected in meeting the requirements for the degree.

Special Programs

INSTITUTE FOR THE STUDY OF FATIGUE, FRACTURE, AND STRUCTURAL RELIABILITY

The basic objective of the Institute for the Study of Fatigue, Fracture, and Structural Reliability of the School of Engineering and Applied Science is to develop an interdisciplinary approach to fatigue research through close cooperation of research workers from different fields. The Institute deals principally with the study of the physical mechanism of damage initiation, in order to establish principles for the rational design of metal alloys of superior fatigue performance on the one hand, and to develop advanced methods of fatigue design and reliability on the other. Because of the large volume, past and current, of straight fatigue testing of standard test specimens in industrial, government, and university laboratories, no testing of this type is generally conducted by the Institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the Institute. In addition to advancing interdisciplinary research, the Institute provides specialized training for graduate students.

The Institute conducts seminars, issues technical reports, and supplies information, lectures, and consultations to many government and industrial research and development laboratories.

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

The Institute for Management Science and Engineering defines and develops new analytical management techniques required to keep pace with an ever-expanding technology. It provides a multidisciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. The principal academic fields directly involved are operations research, mathematics, statistics, economics, and the computer sciences.

The programs of the Institute are concerned with important educational and public-service needs for conservation of national resources. Such programs require full-time interaction among students, faculty, and staff in ways possible only at universities. Through its Program in Logistics, the Institute performs research leading to the development of a science of logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts. Other programs involve optimization, reliability, queuing, forecasting, and cost benefit analyses.

Participation by faculty members and graduate students from all schools in the University is encouraged as consistent with the multidisciplinary objectives of the Institute. Graduate students are supported through research assistantships with thesis and dissertation efforts ordinarily being the major work responsibilities. Reliance is also placed on staff research specialists, and there are special provisions for substantial contributions from distinguished visitors from government, private industry, and other universities.

The Institute disseminates its results through seminars, colloquia, conferences, and a special series of monographs. All research is unclassified.

THE GWU–NASA-LANGLEY GRADUATE PROGRAM

George Washington University, in cooperation with the National Aeronautics and Space Administration's Langley Research Center, has a full-resident graduate engineering program at NASA-Langley, in Hampton, Va., approximately 200 miles south of Washington, D.C.

The program is open to qualified NASA employees and area residents. Courses may also be taken by nondegree students, with the approval of the instructor. Students may be permitted to transfer a maximum of 6 semester hours of approved graduate course credit from other accredited institutions.

Courses in the program are taught by NASA scientists and engineers and the faculty of the School of Engineering and Applied Science. NASA-Langley's extensive scientific and engineering facilities and equipment are utilized whenever feasible.

The program at NASA-Langley leads to the degrees of Master of Science and Doctor of Science (by special permission of the appropriate department chairman) and to the Professional degree of Engineer in the fields of acoustics, aeronautics, environmental modeling (M.S. degree only), fluid mechanics and thermal sciences, solid mechanics and materials engineering, structures and dynamics, and electrical engineering and computer science.

Information regarding this program may be obtained from John L. Whitesides, Jr., GWU-NASA Program, Mail Stop 69, NASA-Langley Research Center, Hampton, Va. 23365.



The GWU–NASA-Langley Joint Institute for Advancement of Flight Sciences (JIAFS)

The National Aeronautics and Space Administration's Langley Research Center joined with George Washington University's School of Engineering and Applied Science in 1971 to create the Joint Institute for Advancement of Flight Sciences. This jointly operated Institute is dedicated to increasing the nation's research and engineering capabilities in relevant technical fields such as acoustics, aeronautics, and structures and dynamics. The Institute, which is located at the Langley Research Center, is dedicated to the advanced training of students and professional engineers in acoustics, aeronautics, environmental modeling, materials science, structures and dynamics, and other relevant areas, and serves to provide a center for advanced research by bringing together researchers and scholars from these fields for the exchange of ideas and findings. It is also the purpose of the Institute to provide the necessary facilities for qualified researchers and scholars who want to engage in research work in these areas.

The organization of the Institute consists of a director, John E. Duberg, Associate Director of the NASA-Langley Research Center, and a co-director, Harold Liebowitz, Dean of the George Washington University's School of Engineering and Applied Science.

The objective of the program is to prepare qualified graduate students for careers in research, development, design, and teaching to meet the challenges of ever-increasing technical problems and the nation's needs in these fields. The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research resources and facilities of NASA-Langley Research Center. These opportunities also enable students to involve themselves in research projects that excite their interest and permit them to associate with prominent visiting members who are working on related problems. Most of the faculty and NASA scientists conduct research, and students take part in the intimate association of research and instruction from the day of their arrival. It is believed that the experience of the students during their stay at NASA-Langley Research Center will be highly rewarding and beneficial.

The current education and research programs are the following:

Acoustics Program.—This program is concerned with the problems of alleviating noise and with providing a technical base for design of acceptable aircraft and space vehicles, noise resistant structures, and ground transportation systems. Areas of research interest include boundary-layer noise, duct acoustics, jet noise, nonlinear problems in acoustics, rotor noise, structural response to noise, mechanical and acoustical coupling problems, and subjective response to noise and vibration.

Aeronautics Program.—This program deals with advanced flight concepts of both STOL and V/STOL aircraft, including areas of performance, flight dynamics, instrumentation, guidance and control, aeroelasticity, and systems analysis. Specific research areas currently being investigated include aerodynamic analysis of jet augmented wings, theoretical fluid mechanics, performance, stability and control of V/STOL aircraft, analysis and flow visualization of wingtip vortices, wind tunnel and flight testing of V/STOL aircraft, airfoil aerodynamics, stall-spin characteristics of aircraft, and experimental evaluation of aircraft handling characteristics.

The Structures and Dynamics Program.—This program is designed to provide a basic understanding and working knowledge of some key areas pertinent to structures, solid mechanics, and dynamics technology including computer-aided design; optimum design of aircraft, aerospace and other structures; and the dynamic and aeroelastic response of large and complex structures. Emphasis will be placed not only on these individual areas but also on their interface and interaction.

The Environmental Modeling Program.—This program is aimed at developing mathematical models of various aspects of atmospheric energy and mass transport and in applying these models both to the prediction of pollutant distribution and transport and to the interpretation of satellite and aircraft measurements. Because of the complexity of the earth-atmosphere system, simplified models are necessary to understand the effects of pollutants on the energy balance, the atmospheric circulation, and the chemistry of the system.

The Materials Science Program.—This program is concerned with analytic and experimental verification of processes which degrade mechanical properties of advanced composites; analysis of corrosion and stress-corrosion of materials in environments encountered by aerospace vehicles; analysis of creep and cyclic creep materials, based on both deterministic models and multiparameter regression; and prediction of mechanical properties of engineering materials in terms of composition, processing conditions, and service history.

Participating in these programs are Graduate Student Research Scholar Assistants, faculty from George Washington University, scientists and engineers from NASA-Langley, and visiting scientists and engineers.



A number of Research Scholar Assistantships are available to qualified students seeking an outstanding opportunity for graduate study and research leading to the degrees of Master of Science and Doctor of Science in the fields of Acoustics, Aeronautics, Environmental Modeling, Materials Science, and Structures and Dynamics. Applicants who are awarded Research Scholar Assistantships will receive stipends of up to $8,000 a year for a Master of Science degree and $9,000 a year for the Doctor of Science degree. Applications, a JIAFS brochure, and additional information may be obtained from Professor S.W. Yuan, JIAFS, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

COOPERATIVE EDUCATION PROGRAM IN ENGINEERING

Cooperative education is a process of education which formally integrates the student's academic study with work experience in cooperating employer organizations. The usual plan is for the student to alternate periods of college study with periods of experience in appropriate fields of industry and government. The experience periods are considered an integral part of the student's education. Through the interaction of the study and work experiences, the student enhances academic knowledge, personal development, and professional preparation. The teaching faculty, the coordinators, and the employing supervisors share in the educational process of the cooperative student.

The following factors are adhered to as closely as possible for the student's working experience:

1. The student's employment is related as closely as possible to his field of study and individual interest within his field.
2. The employment is considered to be a regular, continuing, and essential element in the educational process.
3. The working experience will ideally increase in difficulty and responsibility as the student progresses through the academic curriculum. Normally the salary of the student will increase accordingly.

The student's working experience in industry or government provides the opportunity to meet and work with men and women under varied conditions, to get along with them, learn from them, respect them, and earn their respect. Indeed, these advantages alone could be as important in shaping a young person's life as the opportunity to obtain experience in a chosen field.

International students face several constraints in finding jobs and should not depend on cooperative education income as a financial aid. International students with permanent visas, however, will have better opportunities for jobs.

Advantages of Cooperative Education

Combines Theory and Practice.—By coordinating the work experience in industrial and governmental organizations with the campus education program, theory and practice are closely integrated, and students find greater relevance in their studies. As a result of this alternation between academic and industrial environments, the student tends to understand the role and meaning of each environment, with a deeper appreciation for each.

Helps Finance Educational and Living Expenses.—The student's earnings will contribute substantially to financing his own education and living expenses, leading to independence and contributing significantly to his self-esteem and con-

fidence. As stated earlier, it is expected that as the working experience increases in difficulty and responsibility as the student progresses through the academic curriculum, the salary of the student will increase accordingly.

Serves as a Bridge to the Future.—Cooperative education helps markedly to orient students to the world of work. Most students are genuinely concerned about their future life work. They want to know more about the range of occupations open to them, and the potentials and limitations of these fields. They want to know about the qualifications demanded and their own fitness. Through cooperative education programs, students have opportunities for exploring their own abilities in connection with real jobs, and they find a direct means of gaining information and guidance not only in the occupations in which they are employed but in a number of related fields as well. They have a chance to test their own aptitudes more fully than is normally possible on campus.

Increases Motivation to Achieve.—This coordination of work and study increases student motivation. As students see connections between jobs they hold and the things they are learning in school, greater interest in academic work develops. During the work periods there is a tendency for the student to develop good work habits because his efforts as a productive and salaried employee are rated by the employer.

Enhances Human Relationships.—Because the work experiences involve the students in relations with co-workers who come from a variety of backgrounds, and because success in these jobs requires constructive relationships with colleagues, most students in cooperative education develop deeper understanding of other people and greater skills in human relations.

Augments Development of Maturity.—For many students the work experience contributes to an increased sense of responsibility for their own efforts, more dependence on their own judgments, and a corresponding development of maturity. In addition, the student's role as a team member in a real and productive working environment inculcates a seriousness of life and purpose which is often delayed for the traditional college graduate.

Responsibilities of the Cooperative Student

The cooperative student working in association with the professionals in the field must adopt professional standards of conduct. Such a student is also a representative of the George Washington University School of Engineering and Applied Science. After each work period the student prepares a report describing the duties and responsibilities at work, and the supervisor sends an appraisal of the student's work performance to the Cooperative Program Coordinator. These reports are reviewed with the student.

The cooperative program is a three-way partnership among the student, the employer, and George Washington University. The student's responsibilities extend equally to each of the other two members of the partnership, and the partnership cannot be altered during the program without the knowledge and consent of all.

Why Employers Participate in Cooperative Education Programs

Industry and government agencies have found that cooperative students are valuable employees. Generally speaking, they are alert and energetic young people who, stimulated by a definite goal, return more than a day's work for a day's pay. Graduates of the cooperative program represent a good source of

well-trained manpower. The training period provides an opportunity for the employer to evaluate the student as a prospective permanent employee. Employers feel that this program is an important part of their effort to attract well-qualified employees. At the same time, the student is able to evaluate the employer in terms of his future plans and interests. About half of the cooperative graduates establish such mutually beneficial relationships with their employers that they remain in permanent employment after graduation, with a substantial head start in their careers.

It is emphasized, however, that neither the student nor the employer is obligated for permanent employment after graduation. Industry and government agencies consider participation in cooperative education as a long-range investment rather than a current expense. As a partner with the University, the employer is engaged in a joint effort to develop young talent more fully, thus assuring better education for the student, improved utilization of the graduate, and greater cooperation with the University.

Scholastic Requirements

Students entering the program must be in good academic standing and must have completed at least two semesters of academic study prior to their first full-time work assignment. To remain in the program, the student must maintain a passing average and perform satisfactorily for his employer.

Living Accommodations

Arrangements will be made for students in the cooperative program to retain their dormitory and dining privileges at the University, if they so desire, during the work periods. During this time, they will also retain full student privileges and have access to all University facilities. Faculty will be available for consultation by appointment.

Work-Study Schedules

At this time, individual schedules are being arranged with the various employers in the Washington area. Since each employer operates differently, special schedules are arranged which are mutually satisfactory to the student, the employer, and the School.

Generally, the student's schedule is arranged with the employer after he has successfully completed the first year of study. Many employers will require the student to work during the summer immediately following the freshman year. The student returns to the School for the sophomore year, working again during the second summer. Beginning with the third year, students alternate between employer and classroom each semester for the next two years, returning to the classroom for the fifth and final year. An alternate method is to work a full academic year and then return to school. Schedules for transfer students are arranged on an individual basis according to the number of credit hours transferred and the employer's requirements.

Arrangements have been made or are in progress with many businesses, industrial organizations, and governmental agencies for employment opportunities. Few cooperative job opportunities, however, are available for the summer just prior to the freshman year.

COOPERATIVE PROGRAM WITH NAVY LABORATORIES

Arrangements have been made with the U.S. Naval Ship Research and Development Centers, Annapolis and Carderock, Md., and with other naval laboratories in which it is possible for the student to earn a substantial portion of educational expenses on planned technical work assignments, obtain a Bachelor of Science degree in such areas as civil, electrical, or mechanical engineering, and be in a preferred position upon graduation to obtain a permanent Civil Service position with a grade and salary commensurate with the student's education and experience.

To participate in the program at the naval laboratories, the student must be academically acceptable to the University and must meet the requirements of the Civil Service Commission for employment at these laboratories.

Tuition Aid

Under the Tuition Aid Program offered by the Navy, tuition, textbooks, and fees (exclusive of room and board) up to 50 percent may be granted on request. If tuition assistance is received, the cooperative student must agree to serve as a government civilian employee after graduation for a period to be determined by regulations in effect at that time.

Work Experience

This program integrates formal study at this School with practical work experience, an essential element of the educational process. The employment is related to the field of study in which the student is engaged, and it is diversified to afford breadth of experience. The work experience increases in difficulty and responsibility and, in general, parallels the student's progress through the academic phases of his program.

As a Civil Service employee, the co-op student is eligible for many federal benefits, including annual leave, sick leave, paid holidays, health benefits, and life insurance.

Freshman Admission

Applications for the cooperative education program should be submitted before March 1 of the senior high school year. Students graduating at mid-term and wishing to begin study in the spring semester should apply no later than December 1.

Transfer Student Admission

Transfer students from other institutions should submit cooperative education applications and required credentials prior to June 1 for the fall semester, December 1 for the spring semester, and May 1 for the summer sessions. The transfer student should be in good standing as to scholarship and conduct and should be eligible to return to the last previously attended institution in the semester for which the student seeks admission to this University.

UNDERGRADUATE DUAL-DEGREE PROGRAMS WITH HAMPTON INSTITUTE AND BOWIE STATE COLLEGE

The School of Engineering and Applied Science, Hampton Institute, and Bowie State College, all of which are accredited four-year degree-granting institutions, have established a 3–2 dual-degree program that joins general education and career education in a unique and comprehensive experience. This program is in addition to the engineering programs already offered on the campus at George Washington University.

Hampton and Bowie State offer several four-year degree programs in a variety of disciplines. To provide opportunity for careers in engineering, Hampton Institute and Bowie State joined with the School of Engineering and Applied Science, which offers accredited four-year programs in engineering.

Students enrolled in the 3–2 program at Hampton or Bowie State first follow a general program of study for three years at Hampton Institute or Bowie State. This program is based on the social sciences, humanities, and the preparatory background engineering courses in mathematics, physics, and chemistry, which help develop broad cultural perspectives, analytic abilities, and communication skills.

After successful completion of the first phase of study, students then follow a two-year career program in engineering at the School of Engineering and Applied Science. During this phase of the study, students may specialize in any of the following areas of engineering, which are also offered in GWU's regular four-year programs:

1. Civil Engineering, or the following options: Environmental-oriented Civil Engineering, Computer-oriented Civil Engineering, Geotechnical Civil Engineering.

2. Electrical Engineering, or the following options: Computer Science, Premedical Engineering.

3. Mechanical Engineering, or the following options: Energy Resources and Power, Computer-oriented Mechanical Engineering.

Some of the advantages of the dual degree program follow.

Students may begin their education at Hampton Institute or Bowie State and then obtain a B.S. in an engineering area from George Washington University. This unique academic background provides the student with many options in choosing a profession upon graduation. The student may go into engineering practice, continue study for advanced degrees, or enter other professional areas such as law, medicine, or teaching.

Dual-degree students, while at Hampton, may participate in the Summer Training Program. In this program, students may work for a 12-week period during the summer at the Joint Institute for Advancement of Flight Sciences at the National Aeronautics and Space Administration's (NASA) Langley Research Center in Hampton, Va., obtaining valuable work experience in a first-rate laboratory while earning funds for the following academic year. This program may be made available to some prefreshmen who desire to work upon graduation from secondary school.

Dual-degree students at Bowie State may avail themselves of summer employment through the GWU Cooperative Education Program in Engineering prior to their actual attendance at George Washington University.

In GWU's Cooperative Education Program in Engineering (see page 40) a student may work summers and one or two academic semesters and earn

sufficient funds to help pay expenses while obtaining valuable engineering experience.

The 3–2 program offers the student time to become acclimated to college life and study at a reasonable cost while preparing for an exciting and rewarding profession.

For further information write or call Dean of Admissions and Registrar, Hampton Institute, Hampton, Va. 32668, Phone (804) 727-5328 or 727-5329; or Mr. Johnny W. Ponds, Mathematics Department, Bowie State College, Bowie, Md., 20715, Phone (301) 262-3350; or Manager, Engineering Admissions, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, Phone (202) 676-6158.

CONTINUING ENGINEERING EDUCATION PROGRAM

Today most engineers and their employers are well aware of the rapid advances of knowledge in science and technology. The inability to understand and to apply new technologies can mean both personal and corporate failure. To prevent this potential obsolescence, engineers must involve themselves in a continuing program of technical reading and organized learning.

The School of Engineering and Applied Science meets this need with a comprehensive program of noncredit courses. The program's objective is to increase the competence of practicing engineers rather than to grant further academic degrees. Staff reorganizations require many engineers to change their specialties or to take on additional duties within their present jobs. Continuing engineering education can provide the education and skills the engineer needs to effectively make these changes. Continuing Engineering education also aids in qualifying for promotions and in maintaining certification in certain professional fields.

The program will present about 300 noncredit courses this year. About half of them last for five days (30 classroom hours), while others are for two, three, or four days. Some courses are presented in the evening (two-hour sessions once a week for 10 to 12 weeks), or on Saturday morning. Presentation of theory is often augmented by workshops to give registrants practice in the specific discipline. All courses stress practical applications. Students from all over the nation and from many foreign countries have participated in courses. The variety of experience and background of these students enriches the classroom discussions.

Some of the subjects which have been presented in this program include:

Administration of Safety Functions
Analog and Hybrid Computers
Antenna Systems
Automated Document Storage and Retrieval
Clinical Engineering
Computer-Aided Preliminary Ship Design
Computer Security
Communication Systems
Configuration Management of Software Programs
Configuration Management
Construction Estimating
Cost Analysis for Engineers
Critical Path Method
Data Communications
Digital Communications
Digital Integrated Circuits
Distributed Processing

Electromagnetic Compatability
Electromagnetic Wave Propagation
Electronic Display Technology
Energy Conservation
Environmental Impact Statements
Fault Tree Analysis
Fiber and Integrated Optics
Fibrous Composite Structures
Finite Element Method
Forecasting Techniques
Heat Pipes
Infrared Technology
Intensive and Coronary Care Units
Laser and Fiber Optics Communication
Laser Technology
Life Cycle Costing
Lubrication Technology
Maintenance Management of Medical Instrumentation
Management of Research and Development
Mathematical Theory of Reliability
Metal Fracture and Fatigue
Metric Conversion
Microprocessors and Microcomputers
Minicomputers
Monte Carlo Simulation
Municipal Solid Wastes
Nonlinear Programming
Nonparametric Statistics
Operations Research
OSHA for Industry and Government
Patent Law for Engineers
Practical Electronics
Project Management
Radar Systems
Reliability
Reliability of Nuclear Power Plants
Satellite Communications
Solar Heating and Cooling
Sonar Systems
Specifications and Standards
Speech Communication Aids for the Deaf
Spread Spectrum Communications
Standards and Calibration Labs
Statistics for Engineers
Statistical Techniques in Biomedical Studies
Structured Programming
Surface and Colloid Chemistry
Safety
Technology Trends in Communications
Telecommunications
Temperature Control Systems
Warehousing
Writing Professional and Technical Communications

New courses are added as needs become apparent in various fields, and repeated courses are continuously revised. Seventy-seven new courses were added last year.

In addition to the faculty of the School of Engineering and Applied Science, outstanding lecturers and instructors from other universities, from industry, and from government laboratories and agencies serve on the instructional staff of the program.

The program also offers noncredit contract courses off-campus specifically tailored for the needs and background of the engineers employed by a company or agency. Tuition for these courses is usually slightly lower than for those offered at the University. Such courses have been presented as far away as Argentina.

To receive announcements or additional information on the program, write to Continuing Engineering Education Program, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, or call (202) 676-6106 or (800) 424-9773.

Administration

Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied Science; Co-director of the Joint Institute for Advancement of Flight Sciences*
James Elmer Feir, Ph.D., *Associate Dean of the School of Engineering and Applied Science*
Donald Gross, Ph.D., *Chairman of the Department of Operations Research*
Arnold Charles Meltzer, D.Sc., *Chairman of the Department of Electrical Engineering and Computer Science*
Sam Rothman, Ph.D., *Chairman of the Department of Engineering Administration*
Shao Wen Yuan, Ph.D., *Chairman of the Department of Civil, Mechanical, and Environmental Engineering; Associate Director, Joint Institute for Advancement of Flight Sciences*
Ali B. Cambel, Ph.D., *Director, Energy Programs*
Alfred M. Freudenthal, D.Sc., *Director, Institute for the Study of Fatigue, Fracture, and Structural Reliability*
William H. Marlow, Ph.D., *Director, Institute for Management Science and Engineering*
John Edward Duberg, Ph.D., *Director of the NASA-Langley Graduate Program; Director of the Joint Institute for Acoustics and Flight Sciences*
Malcolm P. Clark, M.S., *Administrator of the NASA-Langley Graduate Program*
William F. Shanahan, B.S., *Manager of Engineering Admissions and Cooperative Education*
John Lindsey Whitesides, Jr., Ph.D., *Assistant Director, Research and Education, Joint Institute for Advancement of Flight Sciences*
John Witherspoon, M.S., *Assistant Administrator of the NASA-Langley Graduate Program*
Jack Emerson Mansfield, B.S. in E.E., *Director of the Continuing Engineering Education Program*
Frederic A. Hooper, M.S., *Research and Resources Officer*
George Ellowitz, B.A., *Executive Associate to the Dean*

DEAN'S COUNCIL

Harold Liebowitz *(Chairman)*, R.R. Fox, N. Kyriakopoulos, John Kaye

Advisory Council*

THE PURPOSES of the Advisory Council for the School of Engineering and Applied Science are to strengthen communication between the School and the other colleges, schools, and divisions of the University as well as between the School and the University's Board of Trustees; to advise on the programs of instruction, research, and service in the School and to help interpret these programs to the community and the nation; and to stimulate support for the continued development of the School and its programs.

* The President of the University, the Vice President for Academic Affairs, and the Dean of the School of Engineering and Applied Science are *ex-officio* members of the Advisory Council.

MEMBERS OF THE COUNCIL FOR 1977–78

Chairman: Stephen R. Woodzell *(University Trustee), Former President of the Potomac Electric Power Company*
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George M. Bunker, *President, Martin Marietta Corporation*
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Ernst Weber, *Chairman, Division of Engineering, National Research Council*
Harold A. Wheeler, *Chief Scientist and Chairman, Hazeltine Corporation*
James F. Young, *Vice President—Engineering, General Electric Company*
L.A. Zadeh, *Chairman, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley*

PROGRAMS OF STUDY AND COURSES OF INSTRUCTION

ON THE FOLLOWING PAGES are listed programs of study, curricula, and courses of instruction offered by the School of Engineering and Applied Science.

Students who are not candidates for degrees but who wish to take courses offered by the School should apply for admission to the Division of University Students.

EXPLANATION OF COURSE NUMBERS

Courses numbered from 1 through 199 are planned for undergraduate credit, although certain courses may be taken for graduate credit when arrangements are approved in advance by the instructor and the Dean. Courses numbered 201 to 300 are planned for graduate credit and may in certain instances be taken by qualified undergraduate students. Courses numbered from 301 to 400 are primarily for doctoral students.

SEMESTER HOURS OF CREDIT

The number of semester hours' credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. Thus, a year course giving three hours of credit each semester is marked (3–3), and a semester course giving three hours' credit is marked (3). A semester hour consists of the completion of one 50-minute period of class work or of one laboratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following each course description is a parenthetical statement listing the semester for which the course is scheduled to be offered. The term "academic year" is used only with two-semester courses, and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester; the term "as arranged" is used for courses which could not be

scheduled at the time of printing this catalogue. Offerings for the summer sessions are not designated in this catalogue. Students should consult the *Summer Sessions Schedule of Classes* for summer offerings. A *Schedule of Classes* is also published for each fall and spring semester which provides up-to-date information concerning the time of course offerings.

KEY TO ABBREVIATIONS

The following abbreviations for course designations are used by George Washington University.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Germ	Germanic Languages and Literatures
HCA	Health Care Administration
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
LEnf	Law Enforcement
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opth	Ophthalmology
Oral	Oral Biology
Orth	Orthopedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
Rad	Radiology
Rel	Religion
SLP	Service Learning Program

SPSc	Service-Learning Political Science
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Operations
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

Applied Science

Interdepartmental offerings.

UNDERGRADUATE COURSES

57 Analytical Mechanics I (2)

First half of a one-year sequence. Concepts of statics, including force systems, equilibrium conditions, simple structures, distributed forces, shear and moments, friction and the concept of work, virtual work and stability. Prerequisite or concurrent registration: ApSc 113, Phys 14. (Fall and spring)

58 Analytical Mechanics II (3)

Second half of a one-year sequence. Concepts of dynamics, including kinematics of particles, velocity and acceleration, Newton's laws of motion, momentum, work, kinetic energy, potential energy, central force fields, vibrations, resonance, dynamics of systems of particles, kinematics of a rigid body, dynamics of a rigid body. Prerequisite: ApSc 57. (Fall and spring)

113 Engineering Analysis I (3)

Analytical methods appropriate to the solution of engineering problems, including application of matrices and linear algebra, ordinary differential equations, vector calculus and integral theorems, complex algebra. Prerequisite: Math 32. (Fall and spring)

114 Engineering Analysis II (3)

Analytical methods appropriate to the solution of engineering problems, including application of Bessel functions, Legendre polynomials, Fourier series and integrals, Laplace transforms, partial differential equations in engineering and applied science. Prerequisite: ApSc 113. (Fall and spring)

115 Engineering Analysis III (3)

Solution of engineering problems using concepts from probability and statistics, including random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, and regression. This methodology applied to problems of structural design, bioengineering, manufacturing processes, product quality, equipment reliability, engineering management, and societal engineering. Prerequisite: Math 32. (Fall and spring)

GRADUATE COURSES

211 Analytical Methods in Engineering I (3)

Engineering applications of the theory of complex variables including contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of Department. (Fall and spring)

212 Analytical Methods in Engineering II (3)

Analytical methods appropriate to the formulation of engineering problems including finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of Department. (Fall)

213 Analytical Methods in Engineering III (3)

Analytical techniques for solution of boundary-initial problems in engineering involving wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of Department. (Fall and spring)

214 Analytical Methods in Engineering IV (3)

Introduction to variational methods in engineering including Ritz and Galerkin approximation methods of boundary-value problems. Aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of Department. (Spring)

215 Analytical Methods in Engineering V (3)

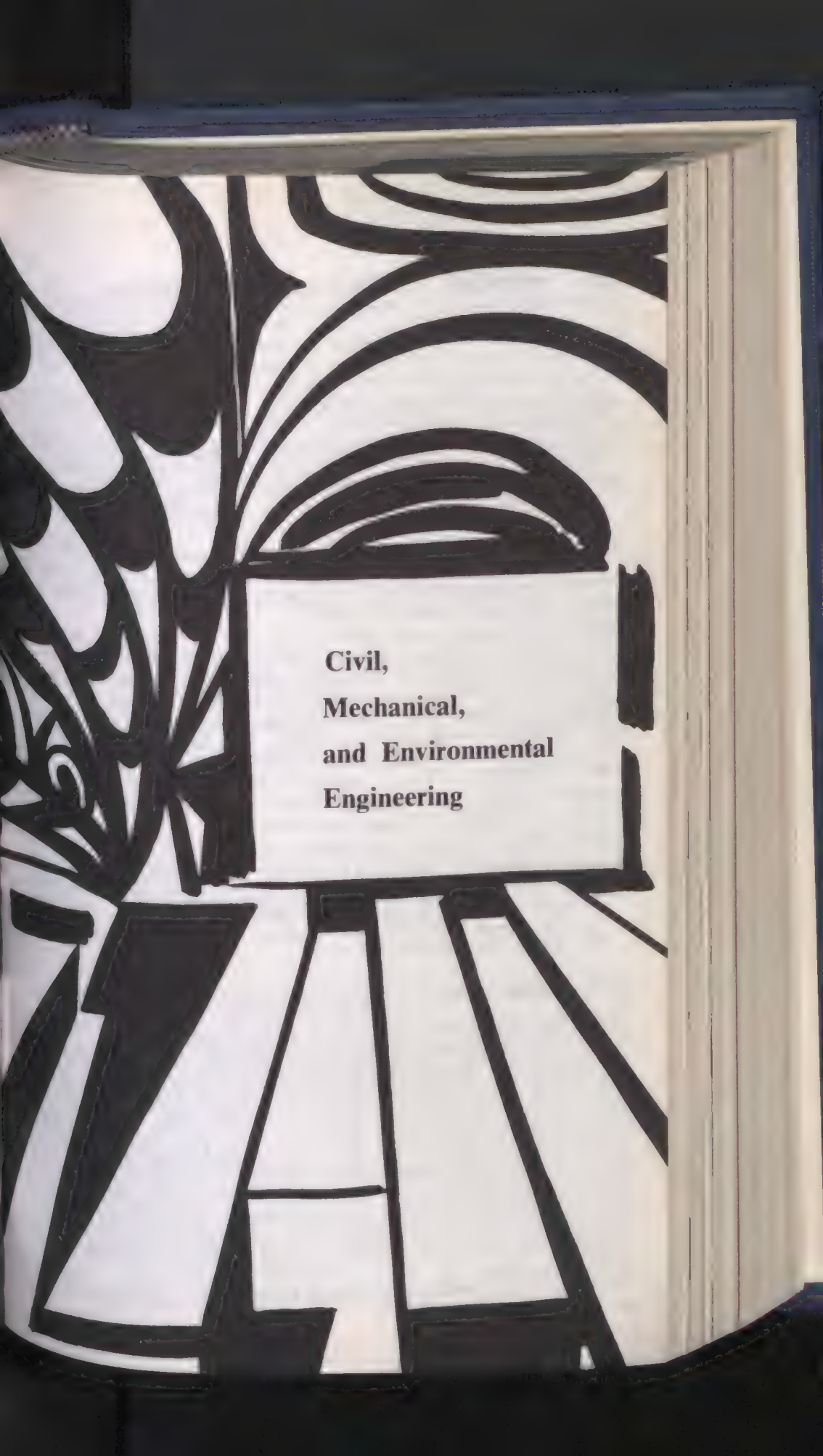
Advanced methods of solution of boundary-initial value problems in engineering, including characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213. (Fall)

216 Special Topics in Engineering Analysis (3)

Selected topics such as (1) perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering, (2) application of singular integral equations in problems of mechanics, (3) applications of elements of functional analysis in engineering and science. Prerequisite: approval of Department. (Spring, even years)






Civil,
Mechanical,
and Environmental
Engineering

Civil, Mechanical, and Environmental Engineering

Professors G.M. Arkilic, R.R. Fox, H. Liebowitz, S.W. Yuan *(Chairman)*, J. Foa, J.E. Feir, T.G. Toridis, J.P. Campbell *(Research)*, J. Eftis, A.K. Noor, R. Goulard, A.B. Cambel, K. Mahmood, A.M. Kiper

Adjunct Professors J.E. Duberg, B.L. Clarkson, R.M. Sorensen, H. Perry, L.W. Tombaugh, W.P. Reid

Professorial Lecturers R.E. Fulton, M.P. Gaus, R. Dillon, C. Molloy, W. Olstad, M.J. Queijo, R.P. Nalesnik, J.B. Scalzi, P. Donely, M.K. Ochi, R.F. Baker, F.L. Young, L.K. Loftin, Jr., M.S. Ojalvo, L. Divone, L.G. Herman, R.M. Thomson, M. Yachnis, R.F. Hoglund, R.S. Levine, M.J. Rabins, W. Viessman, Jr.

Associate Professors M.K. Myers, D.L. Jones *(Research)*, J.L. Whitesides, Jr., C. Gilmore, H. Runyan, Jr. *(Research)*, D.M. Esterling *(Research)*, A.M. Bloom *(Research)*, J.N. Yang, R.E. Kaufman, R.S. Brice *(Research)*

Adjunct Associate Professor B.W. Hannah

Associate Professorial Lecturers W.D. Erickson, R.W. Fralich, E.C. Yates, Jr., N. Salvesen, J. Sobieszczanski, M. Stein, G. Sabnis, R.B. Samworth, B. Whang, G.E. Lamphere, D. Ellison, J.B. Fisher, R.W. Barnwell, A. Sosslau, R.J. Fisher, T. McGean, D. MacKinnon, K. Saczalski, T.M. Walsh, P.B. Buck, E.F. Skelton, H.A. Leybold, M. Lokmanhekim, A.G. Adamantiades, J.A. Belding, Jr., R.M. Brown, J. Ettinger, H.E. Bethel, D.D. Moran, T.F. Zien, E. Glynn, N. Basdekas, P.L. Coe, Jr., C.J. Jachimowski, A.H. Purcell, M.C. Cullingford, D. Feit, R. McConnell, S. Mehrotra, W.J. Walker

Assistant Professors K. Khozeimeh *(Research)*, B.R. Barkstrom *(Research)*, J.D. Lee *(Research)*, F. Farassat *(Research)*

Adjunct Assistant Professors A.K. Trehan

Assistant Professorial Lecturers J.A. Gorman, I.E. Beckwith, R.L. Bowles, J.B. Robertson, G.L. Smith, R.Y. Ting, J.E. Carter, R.C. Montgomery, K.S. Park, T.A. Straeter, J.N. Shoosmith, D. Mulville, J.L. Wagner, S.M. Finger, A. Kehnemui, M. Rozansky, W.J. Boettinger, M.O. Critchfield, J. Hebrank, J.C. Hardin, D.F. Hollingshead, C. Ng

CIVIL ENGINEERING—UNDERGRADUATE STUDY

Civil engineering encompasses those branches of engineering activities most closely related to the control and improvement of our environment and of the conditions of life. Study in this field prepares students for careers in the planning, design, and construction of buildings; bridges; roads; airports; rapid transportation systems; harbors; off-shore facilities; coastal protection structures; flood and pollution control systems for rivers, estuaries, and lakes; inland navigation systems; large power generation and flood control dams; water resources projects; urban renewal and development projects; and pollution control and waste disposal projects. It also provides the scientific and technological background required for careers in municipal engineering, urban and regional planning, and environmental and geotechnical civil engineering; and for careers in engineering research in structural mechanics, ocean engineering, and materials engineering.

The curriculum provides the essentials for beginning a career upon gradua-

tion, for registration as a professional civil engineer as required by law, and for continuing study at the graduate level.

Evening Classes

In response to requests from those employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Civil Engineering in a reasonable period of time, evening classes in the Civil Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

EE 51:	Applications of Computers (3)
Math 30:	Precalculus (3)
Math 31:	Calculus of One Variable (3)
Phys 3:	Foundations of Physics (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
Math 32:	Calculus of Several Variables (3)
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

Third Semester

ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)
ApSc 115:	Engineering Analysis III (3)
Chem 13:	General Chemistry (4)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)

Fourth Semester

ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
CE 110:	Introduction to Environmental Engineering (3)
CE 140:	Materials Science (3)
Phys 16:	Introduction to Modern Physics (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)

Civil Engineering Curriculum

Fifth Semester

CE 120: Introduction to the Mechanics of Solids (3)
CE 123: Structural Theory (6)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 131: Thermodynamics (3)

Sixth Semester

CE 183: Urban Planning (3)
CE 190: Legal and Economic Aspects of Engineering (2)
Geol 136: Engineering Geology (3)
ME 126: Fluid Mechanics (3)
Elective: Selected from humanities or social sciences (6)

Seventh Semester

CE 168: Introductory Soil Mechanics (3)
CE 191: Metal Structures (3)
CE 193: Hydraulics (3)
CE 194: Environmental Engineering I: Water Supply and Resources (3)
Elective: Technical electives (6)

Eighth Semester

CE 182: Foundation Engineering (2)
CE 185: Soil Mechanics and Foundation Engineering Laboratory (1)
CE 192: Reinforced Concrete Structures (3)
CE 197: Environmental Engineering II: Waste and Pollution Control (3)
Elective: Technical electives (5)

Technical Electives

*CE 195: Hydrology (3)
*CE 196: Design and Cost Analysis of Civil Engineering Structures (3)
CE 198: Research (2)
CE 201: Design of Metal Structures (3)
CE 202: Design of Reinforced Concrete Structures (3)
CE 204: Applied Soil Mechanics I (3)
CE 205: Applied Soil Mechanics II (3)
CE 206: Foundation Engineering (3)
CE 210: Methods of Structural Analysis (3)
CE 212: Open Channel Flow (3)
CE 213: Hydraulic Structures (3)
CE 214: Design of Dams (3)
CE 215: Urban Construction Technology (3)
CE 216: Advanced Hydrology (3)
CE 220: Urban Transportation Engineering (3)
CE 243: Environmental Impact Assessment (3)
CE 253: Failure and Reliability Analysis of Engineering Structures (3)
CE 256: Introduction to Ocean and Coastal Engineering (3)
EAd 150: Introduction to Engineering Administration (3)
EngS 234: Composite Materials (3)

* Required course which must be selected from the technical electives.

Computer-oriented Civil Engineering Option

The expanding use of computers in the design and control of engineering systems provides increasing opportunities for engineering careers in which proficiency in the sophisticated use of digital and other computers is essential. This option replaces several technical electives of the principal professional undergraduate program with electives that provide a more comprehensive exposure to computer technology and applications.

Technical Electives for Computer-oriented Civil Engineering Option

*CE 196:	Design and Cost Analysis of Civil Engineering Structures (3)
CE 198:	Research (2)
CE 210:	Methods of Structural Analysis (3)
CSci 278:	Analog and Hybrid Computers (3)
EE 152:	Introduction to Digital Computers (3)
EngS 282:	Computer-aided Design (3)
EngS 283:	Application of Computer Graphics in Engineering (3)
EngS 284:	Numerical Methods in Engineering (3)

Environmental-oriented Civil Engineering Option

The world-wide growth of industrialization is causing increasing concern for protection of the human environment. Part of this problem involves water supply and treatment, pollution of rivers, lakes, and oceans, and solid waste treatment and disposal. Through a selective choice of technical electives the student is provided with an opportunity to gain increased exposure to this developing aspect of civil engineering.

Technical Electives for Environmental-oriented Civil Engineering Option

*CE 195:	Hydrology (3)
*CE 196:	Design and Cost Analysis of Civil Engineering Structures (3)
CE 198:	Research (2)
CE 240:	Environmental Microbiology (3)
CE 241:	Environmental Chemistry (3)
CE 242:	Solid Waste Disposal (3)
CE 243:	Environmental Impact Assessment (3)
Bioc 221:	General Biochemistry (3 or 4)
BiSc 11–12:	Introductory Biology for Science Majors (4–4)
†Chem 50:	Introduction to Organic Chemistry (4)
EngS 242:	Materials Recycling and Recovery (3)
ME 176:	Environmental Engineering Problems (3)
†Micr 211:	Microbiology (4)

Geotechnical Civil Engineering Option

Geotechnical civil engineering encompasses engineering problems involving soil mechanics, foundation engineering, rock mechanics, and geological aspects of engineering. More specifically, planning, design, and construction of

* Required course which must be selected from the technical electives.
† For Chemistry and Microbiology course descriptions, see the *Undergraduate and Graduate Bulletin*.

structures founded on or constructed of soil and rock constitute the main features of this branch of civil engineering. Included are the design and construction of foundations for all types of buildings, bridges, highway and airfield pavements; design and construction of earth and rock-fill dams, embankments, waterfront structures, tunnels, drainage facilities, and stabilization procedures for reclamation of marginal lands. Engineering geology, which is the application of geological data, principles, and interpretations to naturally occurring earth and rock masses, constitutes an important part in the planning and design stages of civil engineering structures of the above type. The Geotechnical Civil Engineering option provides the student with the fundamentals for subsequent growth and development in this branch of civil engineering.

CURRICULUM

Prerequisite: first four semesters as described in the Core Curriculum, see page 57, with the following changes:

Third Semester: *Geology 21 *Physical and Evolutionary Geology* (3) will be taken instead of the elective.

Fourth Semester: *Geology 122 *Structural Geology* (3) will be taken instead of (a) CE 110 *Introduction to Environmental Engineering* and (b) elective.

Fifth Semester

CE 120:	Introduction to the Mechanics of Solids (3)
CE 123:	Structural Theory (6)
ME 131:	Thermodynamics (3)
*Geol 163:	Sedimentation (4)

Sixth Semester

ME 126:	Fluid Mechanics (3)
CE 190:	Legal and Economic Aspects of Engineering (2)
*Geol 128:	Geomorphology (3)
*Geol 136:	Engineering Geology (3)
Elective:	Selected from humanities or social sciences (6)

Seventh Semester

CE 168:	Introductory Soil Mechanics (3)
CE 191:	Metal Structures (3)
CE 193:	Hydraulics (3)
CE 194:	Environmental Engineering I: Water Supply Resources (3)
CE 195:	Hydrology (3)
*Geol 189:	Geophysics for Geologists (3)

Eighth Semester

CE 182:	Foundation Engineering (2)
CE 185:	Soil Mechanics and Foundation Engineering Laboratory (1)
CE 192:	Reinforced Concrete Structures (3)
*Geol 195:	Field Work (2)
Elective:	Selected from humanities or social sciences (6)
Elective:	Technical elective (2)

* For Geology course descriptions, see the *Graduate and Undergraduate Bulletin.*

Civil Engineering Undergraduate Courses

110 Introduction to Environmental Engineering (3)

Chemistry of natural water as it affects hardness, alkalinity, corrosion, and carbonate balance. Water treatment chemistry, softening, coagulation, and flocculation. Chemistry of rivers, oxygen balance, nitrogen cycle, carbon cycle, eutrophication. Waste water treatment. Removal of dissolved organic material, nitrogen, phosphorous, and chlorination. Classification of organic and inorganic air pollutants. Chemical reaction and formation of secondary air pollutants. Chemical analysis of inorganic pollutants; fluorides, oxides of nitrogen, sulfates, chlorides, sulfur compounds, oxides of carbon, and oxidants. Chemical analysis of organic pollutants; aliphatic hydrocarbons. Control of pollutant emission by absorption, adsorption, and combustion. Prerequisite: Chem 13. (Spring)

120 Introduction to the Mechanics of Solids (3)

Three-dimensional strain and stress. Constitutive equations for elastic, viscoelastic, and plastic materials. Axial load, bending and torsion of struts and beams. Instability and failure. Prerequisite: ApSc 58. (Fall)

123 Structural Theory (6)

Theory of determinate and indeterminate structures using both classical and modern approaches. Prerequisite or concurrent registration: CE 120. (Fall)

140 Materials Science (3)

Electron structure of atoms; atomic and molecular bonding; energy bands; crystal structure; imperfections; noncrystalline solids; reaction rates; diffusion; transport phenomena—thermal conductivity, electrical conduction; metals, insulators, semiconductors; magnetism. Prerequisite: Chem 13; concurrent registration: Phys 16. (Spring)

166 Materials Engineering (2)

Mechanical properties and their description; effect of microstructure on the mechanical behavior of metals, ceramics, polymers, and polyphase materials; effect of strain-rate and temperature; creep, fatigue, and fracture; effect of surface and environment; materials evaluation for structural performance. Prerequisite: CE 140; concurrent registration: CE 120. (Fall)

167 Mechanics of Materials Laboratory (1)

Measurement of strains and study of failure resulting from applied forces; ductile, brittle, anisotropic, elastomeric, and plastic materials; tension, compression, bending, creep, and fatigue loading. Prerequisite or concurrent registration: CE 166. (Fall)

168 Introductory Soil Mechanics (3)

Engineering properties of soils; analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120, ME 126. (Fall)

182 Foundation Engineering (2)

Subsurface exploration, design of shallow foundations, design of pile foundations, earth-retaining structures. Prerequisite: CE 168. (Spring)

183 Urban Planning (3)

Engineering aspects of urban planning, including transportation, water supply and sewerage, public utilities, safety and convenience, and natural environment. (Spring)

185 Soil Mechanics and Foundation Engineering Laboratory (1)

Laboratory experiments for the classification, strength, compressibility and general engineering properties of soils. Prerequisite: CE 168. (Spring)

190 Legal and Economic Aspects of Engineering (2)

Laws relating to engineering practice, preparation of contract documents and specifications, consideration of economic factors in engineering design decisions. (Spring)

191 Metal Structures (3)

Principles of the design of metal structures; structural elements; connections; specific problems of analysis; methods of construction. Prerequisite: CE 123. (Fall)

192 Reinforced Concrete Structures (3)

Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 123. (Spring)

193 Hydraulics (3)

Fluid statics: applications to calculation of boundary forces in a static fluid, buoyancy, and flotation. Application of kinematic principles; flow fields, stream tubes, and flow nets. Fluid dynamics: applications to pipe flow, hydraulic models, measurement of pressure, and velocity. Open channel flow: applications to water resources engineering. Prerequisite: ME 126. (Fall)

194 Environmental Engineering I: Water Supply and Resources (3)

Planning and design of water supply and waste-water disposal systems. Water quality control and treatment processes. Desalination, stream pollution control. Prerequisite or concurrent registration: CE 193. (Spring)

195 Hydrology (3)

Descriptive hydrology: hydrologic cycle, precipitation, stream flow, evaporation, and transpiration. Quantitative hydrology: hydrograph analysis, estimating volume of runoff, runoff from snow, hydrographs of basin outflow, storage routing. Probability concepts in hydrology: flood frequency, rainfall frequency, drought, stochastic hydrology. Prerequisite or concurrent registration: ApSc 115, ME 126, CE 193. (Fall)

196 Design and Cost Analysis of Civil Engineering Structures (3)

Design of civil engineering structures such as wharves, piers, bulkheads, tunnels, dams, bridges, water treatment, and drainage systems. Prerequisite: senior status. (Spring)

197 Environmental Engineering II: Waste and Pollution Control (3)

Disposal of sewage, biological treatment, chemical treatment, filtration, activated sludge, sludge handling and disposal. Control of industrial wastes and of nuclear waste products. Solid waste disposal. Prerequisite: CE 193. (Fall)

198 **Research** (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

MECHANICAL ENGINEERING—UNDERGRADUATE STUDY

Mechanical engineering is primarily concerned with physical systems in motion. A mechanical engineer is concerned with the conversion, transfer, and control of energy from its source to its moving system. Land and marine vehicles, transportation systems, air-conditioning systems, nuclear reactors and fuel cells, low-pollution control devices, energy resources and the means of practical and economical conversion of the various forms of energy to mechanical and electrical power, and a host of other devices lie in this domain. Training in this area should provide the ability to formulate problems based on fundamental laws of nature, to recognize the types of methods which are applicable to their solution, to read with understanding the relevant work, and to come up with a usable answer. The mechanical engineering curriculum provides a background for careers in research, design, development, and manufacture in a wide variety of industries.

Course offerings in mechanical engineering, which begin with a broad foundation in physics, chemistry, mathematics, humanities, and social sciences, consist of studies in basic mechanics of solids and fluids, electricity and electronics, material sciences, dynamic analysis, thermal sciences, energy conversion and power, environmental control, and the design of machines and systems and their control. Technical electives in the senior year allow students interested in computers to select an option which will prepare them for careers in computing as well as graduate study in computer-dominated or computer-oriented professional fields. The program outlined below is based on the concept that the mechanical engineer must be prepared to meet the challenge of ever-increasing technical, economic, and social problems.

Graduates are qualified for professional positions in design, analysis, manufacture, and application of machines, process, and control, or in research and development, as well as for graduate work.

Evening Classes

In response to requests from those employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Mechanical Engineering in a reasonable period of time, evening classes in the Mechanical Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Junior Year Abroad Program

The School of Engineering and Applied Science and the Institute of Sound and Vibration Research of the University of Southampton, England, have established an exchange program so that graduate students in acoustics at both institutions may transfer academic credits to either University in fulfillment of the requirements for advanced degrees. A special arrangement has now been made

to extend the graduate exchange program to the undergraduate level, enabling some mechanical engineering students to spend the junior year abroad.

The program furthers a student's particular academic interests in mechanical engineering and develops knowledge of world affairs in general, and international technical fields in particular.

Applicants must apply for admission to the Junior Year Abroad program to the Department Chairman before the end of the fall semester of the sophomore year. Approval must be given by the Department Chairman and the Dean of the School of Engineering and Applied Science.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

EE 51:	Applications of Computers (3)
Math 30:	Precalculus (3)
Math 31:	Calculus of One Variable (3)
Phys 3:	Foundations of Physics (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
Math 32:	Calculus of Several Variables (3)
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

Third Semester

ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)
ApSc 115:	Engineering Analysis III (3)
Chem 13:	General Chemistry (4)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)

Fourth Semester

ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
CE 140:	Materials Science (3)
EE 11:	Linear Networks I (3)
Phys 16:	Introduction to Modern Physics (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)

Mechanical Engineering Curriculum

Fifth Semester

CE 120:	Introduction to the Mechanics of Solids (3)
CE 166:	Materials Engineering (2)

CE 167: Mechanisms, Analysis, and Synthesis (3)
ME 131: Thermodynamics (3)
ME 134: Introduction to Vibration Analysis (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

EE 20: Introductory Engineering Electronics (3)
EE 172: Control Systems (3)
ME 120: Methods of Engineering Experimentation (2)
ME 126: Fluid Mechanics (3)
ME 148: Thermodynamic Analysis (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

ME 155: Compressible Fluid Flow (3)
ME 187: Heat Transfer Theory (3)
ME 190: Mechanisms, Analysis, and Synthesis (3)
ME 191: Mechanical Design (3)
Elective: Technical electives (6)

Eighth Semester

ME 152: Mechanical Engineering Laboratory (2)
ME 193: Engineering Systems Design (3)
ME 194: Energy Conversion (3)
Elective: Technical electives (6)

Technical Electives

CE 197: Environmental Engineering II: Waste and Pollution Control (3)
EAd 150: Introduction to Engineering Administration (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
EngS 251–52: Transportation Workshop (3–3)
*ME 176: Environmental Engineering Problems (3)
ME 215: Theory of Vibrations (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 225: Turbomachinery I (3)
ME 237: Propulsion I (3)
ME 240: Kinematic Synthesis (3)
ME 247: Fluidics (3)

Technical Electives for Computer-oriented Mechanical Engineering Option

CSci 278: Analog and Hybrid Computers (3)
EE 152: Introduction to Digital Computers (3)
EE 157: Machine and Assembly Language Programming (3)
EngS 282: Computer-aided Design (3)
EngS 283: Application of Computer Graphics in Engineering (3)
EngS 284: Numerical Methods in Engineering (3)
*ME 176: Environmental Engineering Problems (3)

* Required course which must be selected from the technical electives.

Technical Electives for Energy Resources and Power-orient
Mechanical Engineering Option

EE 177:	Electrical Energy Conversion (3)
EngS 208:	Energy Conservation (3)
EngS 214:	Geothermal Energy (3)
*ME 176:	Environmental Engineering Problems (3)
ME 224:	Fundamentals of Combustion Engines (3)
ME 225:	Turbomachinery I (3)
ME 237:	Propulsion I (3)
ME 259:	Solar Heating and Cooling Systems (3)
ME 260:	Heating, Refrigeration, and Air Conditioning (3)
ME 283:	Nuclear Reactor Engineering I (3)
ME 294:	Wind Energy (3)

Mechanical Engineering Undergraduate Courses

120 Methods of Engineering Experimentation (2)

Acquisition and analysis of experimental data. Laws of modeling a simulation. Report formulation and presentation. Basic principles of v rious measuring instruments and sensors. Laboratory experiments, inclu ing use of strain gages, oscilloscopes, various tranducers, etc. Introductio to basic experimental techniques related to dynamics, fluid flow, a thermal sciences. Prerequisite: CE 120, ME 131. (Spring)

126 Fluid Mechanics (3)

Fluid properties, regimes in fluid mechanics, fluid statics, fluid kinematics basic equations, one- and two-dimensional inviscid incompressible flow viscous incompressible flow, dimensional method. Prerequisite: ApSc (Spring)

131 Thermodynamics (3)

Fundamental thermodynamic concepts, Zeroth law of thermodynam and temperature measurements, work and heat, first law of thermod namics, properties of pure substances, first-law analysis of some thermo dynamic systems, second law of thermodynamics, reversibility, entropy second-law analysis of thermodynamic systems. Prerequisite or concurren registration: ApSc 58. (Fall)

134 Introduction to Vibration Analysis (3)

Natural frequencies and response of single- and multiple-degree of free dom mechanical systems to dynamic loads. Effect of damping, transien and steady-state analysis. Prerequisite: ApSc 58. (Fall)

148 Thermodynamic Analysis (3)

Analysis of thermodynamic power and refrigeration cycles; thermody namics of mixtures of substances; properties of air-water vapor mixtures psychrometry and analysis of cooling tower and air-conditioning plan third law of thermodynamics and absolute entropy; evaluation of combus tion processes. Molecular distributions and models; introduction to sta tistical and quantum mechanics; statistical thermodynamics and thermody namic properties of gases and solids. Prerequisite: ME 131. (Spring

* Required course which must be selected from technical electives.

152 **Mechanical Engineering Laboratory** (2)

Experimental study of various engineering systems. Laboratory projects include experimental design, modeling and simulation parameters, data acquisition, and report presentation techniques. Prerequisite: ME 120. (As arranged)

155 **Compressible Fluid Flow** (3)

Introduction to compressible flow, basic equations, propagation of motion in compressible fluids, isotropic-flow relations, steady one-dimensional flow, wave phenomena, small perturbation theory, slender-body theory, method of characteristics. Prerequisite: ME 126, 131. (Fall)

176 **Environmental Engineering Problems** (3)

Classification and effects of air pollutants; air-quality criteria and standards; analysis of pollutants; sources of pollutants and emission inventory; emission-control equipment. Water-quality standards; sewage and industrial waste characterization and pollutional effects in natural waters; primary, biological, and tertiary treatment of wastes; sludge handling and disposal. Prerequisite: senior status. (Fall)

187 **Heat Transfer Theory** (3)

Heat transfer processes. General heat conduction equations; steady- and unsteady-state heat conduction problems. Methods of analysis; analytical, analog, and numerical solution methods. Fundamentals of convective-heat transfer. Evaluation of convective-heat transfer coefficients; dimensional analysis, boundary-layer approach, analogy between heat and momentum transfer. Energy exchange by thermal radiation; fundamental concepts and laws, radiation properties, radiative-heat transfer between surfaces. Design considerations; heat-exchanger design and selection. Prerequisite: ME 126. (Fall)

190 **Mechanisms, Analysis, and Synthesis** (3)

Kinematics and dynamics of mechanisms. Displacement, velocities, accelerations in linkage and cam systems by analytical and graphical methods. Prerequisite: ApSc 58. (Fall)

191 **Mechanical Design** (3)

Introduction to design concept, selection of materials, and strength of mechanical elements; design of machine components such as shafts, springs, bearings, gears, couplings, screws, and related mechanical components. Prerequisite: senior status. (Fall)

193 **Engineering Systems Design** (3)

Creative engineering design, problem definition, and concept generation. Familiarization with standard machine components. Practice in integrating a variety of core disciplines via system design projects. Visual thinking, graphical communication, analysis and optimization techniques. Creative solutions to current, real engineering design problems. Design projects may integrate with ME 152 Mechanical Engineering Laboratory projects. Prerequisite: ME 191. (Spring)

194 **Energy Conversion** (3)

Energy resources of the earth; energy, society, and the national economy; issue of energy and the environment, future outlook for energy supply and demand. Conversion of energy; fundamental principles and technological options, efficiency of different energy converters. Current technologies and longer-range possibilities. Generation of electricity, trends

in the electricity industry; nuclear power systems—growth, economic, and environmental impacts. Unconventional methods of power generation; direct energy conversion. Prerequisite: EE 20, ME 148. (Spring)

198 **Research** (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

ENGINEERING SCIENCE—UNDERGRADUATE COURSE

4 **Descriptive Geometry and Drafting** (3)

Introductory descriptive geometry. Use of equipment. Points, lines, curves, planes, and surfaces; principal, auxiliary, and orthographic views; isometric views, intersection of surface. Technical sketching, dimensioning and precision, machine elements. Detail and assembly drawings. Structural elements. Layout and fabrication drawings, pipe and electric prints. (Spring)

GRADUATE STUDY

Developments in science and technology in the decades to come require that the engineer be thoroughly grounded in fundamentals as well as in the new emerging technological and scientific disciplines. The modern engineer must also master techniques in analysis, computation, design, and synthesis. Amid the proliferation of knowledge and technological specialty, the Department adheres to the principle that versatility and depth in scientific fundamentals should be the characteristic features of any graduate program that attempts to prepare the student to cope with engineering developments.

The Department of Civil, Mechanical, and Environmental Engineering offers graduate programs in the various areas of concentration on three degree levels: the Master of Science degree, the Professional degree, and the Doctor of Science degree.

The Doctor of Science degree is offered in the following areas: Acoustics; Aeronautics; Energy, Resources, and Environment; Environmental and Water Resources (except Option I, Environmental Engineering, which is for the M.S. and Professional degrees only; and Option III, Water Resources Planning, which is for the M.S. degree only); Fluid Mechanics and Thermal Sciences; Hydromechanics and Ocean Engineering; Solid Mechanics and Materials Engineering; Structural Engineering; Structures and Dynamics; and Transportation Engineering (except Option III, which is for the M.S. and Professional degrees only).

The Master of Science and the Professional degrees are offered in all of the aforementioned areas and in the following areas: Environmental Modeling, Geotechnical Engineering, Mechanical Engineering Design, and Public Works Engineering.

Courses for these specializations are listed in subsequent pages. As part of the interdisciplinary program, students elect approved courses from other departments of the School of Engineering and Applied Science, as well as from other schools and divisions of the University. Depending upon the interest of the student, some of the programs leading to the degrees of Master of Science

and, by special permission of the appropriate department chairman, Doctor of Science are given at the NASA-Langley Research Center, Langley Station, Hampton, Va. NASA-Langley's extensive scientific and engineering facilities and equipment are utilized whenever feasible.

Each program is arranged to fit the student's individual needs and interests and utilize previous experience and background. This background should normally include an undergraduate degree in engineering, the physical sciences, or applied mathematics. Each student is assigned a faculty adviser on the basis of study interests, enabling a close student-faculty relationship to develop during the course of the program.

Fields and Area of Concentration

Programs of study in any field of concentration will generally include courses from appropriate allied areas.

ACOUSTICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
*EngS 203–4: Probability and Statistics of Metrology
*EngS 217: Analytical Mechanics
EngS 270: Theoretical Acoustics I
*EngS 271: Random Process Theory I
*EngS 272: Random Process Theory II
*EngS 273: Time Series Analysis
EngS 274: Noise and Vibration Control
*EngS 275: Theoretical Acoustics II
*EngS 276: Acoustical and Mechanical Measurements
*EngS 277: Physical Acoustics
*EngS 278: Psychological and Physiological Acoustics
*EngS 279: Human Factors in Engineering
*EngS 280: Special Topics in Acoustics
EngS 298: Research
EngS 299–300: Thesis Research
*EngS 310: Aeroacoustics
*EngS 311: Nonlinear Acoustics
*EngS 312: Theory of Random Vibration
*EngS 313: Structural Acoustics Interaction
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 312: Theory of Turbulence

AERONAUTICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
ApSc 216:	Special Topics in Engineering Analysis
EE 202:	Linear System Theory I
*EngS 217:	Analytical Mechanics
EngS 284:	Numerical Methods in Engineering
ME 215:	Theory of Vibrations
ME 221:	Intermediate Fluid Mechanics
ME 222:	Applied Fluid Dynamics
ME 223:	Aeroelasticity
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 235:	Compressible Flow
ME 237:	Propulsion I
*ME 248:	Seminar: Aircraft Design I
*ME 249:	Seminar: Aircraft Design II
*ME 270:	Aerodynamics of Flight Vehicles
*ME 271:	VTOL Aircraft Technology
*ME 272:	Powered-lift Technology
*ME 273:	Principles of Automatic Flight Control
*ME 274:	Principles of Flight Guidance
ME 275:	Stability and Control of Vehicles
*ME 277:	Numerical Methods in Fluid Mechanics
*ME 278:	Performance, Stability, and Control of Helicopters
*ME 279:	Special Topics in Flight Sciences
ME 281:	Nonequilibrium Thermodynamics
*ME 290:	Kinetic Theory of Gases
ME 295:	Statistical Thermodynamics
ME 298:	Research
ME 299–300:	Thesis Research
ME 312:	Theory of Turbulence
ME 315:	Hypersonic Flow
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research

ENERGY, RESOURCES, AND ENVIRONMENT

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 215:	Analytical Methods in Engineering V
CE 243:	Environmental Impact Assessment
EAd 221–22:	Environmental Management
EAd 283:	Systems Engineering I
EngS 206:	Technology and Human Needs
EngS 207:	Engineering Climatology
EngS 208:	Energy Conservation
EngS 210:	Quantitative Aspects of Social Phenomena
EngS 212:	Nonrenewable Resources
EngS 213:	Renewable Resources
EngS 214:	Geothermal Energy
EngS 242:	Materials Recycling and Recovery
EngS 270:	Theoretical Acoustics I
EngS 284:	Numerical Methods in Engineering

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

ME 204: Advanced Instrumentation Techniques
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engines
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 235: Compressible Flow
ME 237: Propulsion I
ME 254: Intermediate Heat and Mass Transfer
ME 257: Energy Technology I
ME 258: Energy Technology II
ME 259: Solar Heating and Cooling Systems
ME 260: Heating, Refrigeration, and Air Conditioning
ME 261: Fundamentals of Environmental Control I
ME 280: Advanced Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 282: Fossil Fuels
ME 283: Nuclear Reactor Engineering I
ME 284: Nuclear Reactor Engineering II
ME 287: Heat Conduction
ME 290: Kinetic Theory of Gases
ME 291–92: Power Systems
ME 293: Combustion
ME 294: Wind Energy
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research
OR 232: Applications of Linear and Nonlinear Optimization Theory

ENVIRONMENTAL AND WATER RESOURCES ENGINEERING

Option I: Environmental Engineering

ApSc 213: Analytical Methods in Engineering III
Bioc 221: General Biochemistry
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 211: Waste Water Treatment
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 237: Advanced Sanitary Engineering Design
CE 240: Environmental Microbiology
CE 241: Environmental Chemistry
CE 242: Solid Waste Disposal

CE 243:	Environmental Impact Assessment
CE 272:	Advanced Waste Treatment Process Design
CE 277:	Industrial Waste Treatment
CE 278:	Pollution Transport System
CE 281:	Special Topics in Water Resources
CE 282:	Hydraulic Modeling
CE 298:	Research
CE 299–300:	Thesis Research
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
EAd 204:	Administration of Engineering Contracts
EAd 210:	Engineering Law
EAd 261:	Economic Analysis in Engineering Planning
EngS 242:	Materials Recycling and Recovery
EngS 260:	Random Process Theory in Engineering
EngS 284:	Numerical Methods in Engineering
ME 221:	Intermediate Fluid Mechanics
ME 262:	Fundamentals of Environmental Control II
ME 263:	Environmental Control Processes I
*Micr 211:	Microbiology
*U&RP 204:	Urban Development Planning

Option II: Water Resources Engineering

ApSc 211:	Analytical Methods in Engineering I
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
CE 208:	Rock Engineering
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 214:	Design of Dams
CE 216:	Advanced Hydrology
CE 219:	Groundwater and Seepage
CE 243:	Environmental Impact Assessment
CE 255:	Coastal Processes
CE 256:	Introduction to Ocean and Coastal Engineering
CE 274:	Mechanics of Water Waves
CE 276:	Water Resources Planning and Control
CE 278:	Pollution Transport System
CE 281:	Special Topics in Water Resources
CE 282:	Hydraulic Modeling
CE 298:	Research
CE 299–300:	Thesis Research
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
CE 312:	Advanced Hydraulics
CE 398:	Advanced Reading and Research
CE 399:	Dissertation Research

* For Microbiology and Urban and Regional Planning course descriptions, see the *Undergraduate and Graduate Bulletin*.

EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 312: Theory of Turbulence
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 273: Digital Systems Simulation

Option III: Water Resources Planning

ApSc 213: Analytical Methods in Engineering III
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EAd 211–12: Engineering Administration
EAd 269: Elements of Decision-making and Problem-solving
EAd 283: Systems Engineering I
EAd 284: Systems Engineering II
EngS 206: Technology and Human Needs
EngS 213: Renewable Resources
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 377: Advanced Stochastic Models in Operations Research
*Econ 217–18: Survey of Economics
*Econ 235: Energy Resources and Policy
*Econ 237: Seminar: Economics of the Environment and Natural Resources
*Geog 222: Seminar: Resources and the Environment
*Geog 223: Seminar: The Population-Food Balance
*PSc 206: Science, Technology, and Public Affairs

* For course descriptions, see the *Undergraduate and Graduate Bulletin*.

ENVIRONMENTAL MODELING*

ApSc 211:	Analytical Methods in Engineering I
ApSc 213:	Analytical Methods in Engineering III
*EngS 263:	Atmospheric Physics for Engineers I
*EngS 264:	Atmospheric Physics for Engineers II
EngS 284:	Numerical Methods in Engineering
EngS 298:	Research
EngS 299–300:	Thesis Research
EngS 314:	Advanced Numerical Methods in Engineering
ME 221:	Intermediate Fluid Mechanics
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 265:	Air-pollution Meteorology
ME 282:	Energy Technology
ME 285:	Reaction Kinetics
ME 288:	Convective Heat and Mass Transfer
ME 289:	Radiative Heat Transfer
ME 296:	Special Topics in Heat and Mass Transfer
ME 312:	Theory of Turbulence

FLUID MECHANICS AND THERMAL SCIENCES

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
ApSc 216:	Special Topics in Engineering Analysis
CE 274:	Mechanics of Water Waves
EE 133:	Electromagnetic Waves
EE 236:	Plasma Dynamics
EngS 218:	Introduction to Continuum Mechanics
EngS 289:	Special Topics in Theoretical and Applied Mechanics
EngS 315:	Introduction to Nonlinear Mechanics of Continua
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 221:	Intermediate Fluid Mechanics
ME 222:	Applied Fluid Dynamics
ME 223:	Aeroelasticity
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 235:	Compressible Flow
ME 280:	Advanced Thermodynamics
ME 281:	Nonequilibrium Thermodynamics
ME 282:	Fossil Fuels
ME 287:	Heat Conduction
ME 288:	Convective Heat and Mass Transfer
ME 289:	Radiative Heat Transfer
ME 295:	Statistical Thermodynamics
ME 297:	Special Topics in Fluid Mechanics
ME 298:	Research
ME 299–300:	Thesis Research
ME 310:	Mechanics of Non-Newtonian Fluids
ME 311:	Nonsteady Flow
ME 312:	Theory of Turbulence

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

ME 313: Magnetofluidmechanics
ME 315: Hypersonic Flow
ME 317: Physical Gas Dynamics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

GEOTECHNICAL ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 207: Soil Dynamics
CE 208: Rock Engineering
CE 209: Theoretical Soil Mechanics
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 219: Groundwater and Seepage
CE 221: Pavement and Runway Design
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 265: Special Topics in Geotechnical Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EngS 221: Theory of Elasticity I
EngS 256: Introduction to the Theories of Inelastic Media
EngS 285: Finite Element Methods in Engineering Mechanics
*Geol 128: Geomorphology
*Geol 189: Geophysics for Geologists
*Geol 224: Advanced Structural Geology

HYDROMECHANICS AND OCEAN ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 203: Prestressed Concrete Structures
CE 206: Foundation Engineering
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering

* For Geology course descriptions, see the *Undergraduate and Graduate Bulletin*.

CE 257:	Harbor and Coastal Engineering I
CE 258:	Harbor and Coastal Engineering II
CE 265:	Special Topics in Geotechnical Engineering
CE 274:	Mechanics of Water Waves
CE 275:	Special Topics in Ocean Engineering
CE 282:	Hydraulic Modeling
CE 298:	Research
CE 299–300:	Thesis Research
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
CE 312:	Advanced Hydraulics
CE 398:	Advanced Reading and Research
CE 399:	Dissertation Research
EngS 228:	Physical Oceanography
EngS 260:	Random Process Theory in Engineering
*Geol 181:	General Oceanography
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 221:	Intermediate Fluid Mechanics
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 297:	Special Topics in Fluid Mechanics

MECHANICAL ENGINEERING DESIGN (INCLUDING COMPUTER-ORIENTED DESIGN)

EngS 215:	Advanced Strength of Materials
EngS 251–52:	Transportation Workshop
EngS 282:	Computer-aided Design
EngS 283:	Application of Computer Graphics in Engineering
ME 215:	Theory of Vibrations
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 221:	Intermediate Fluid Mechanics
ME 225:	Turbomachinery I
ME 226:	Turbomachinery II
ME 240:	Kinematic Synthesis
ME 241:	Engineering Systems Design
ME 243:	Advanced Mechanical Engineering Design
ME 246:	Electromechanical Control Systems
ME 247:	Fluidics
ME 251:	Advanced Electromechanical Control Systems
ME 298:	Research
ME 299–300:	Thesis Research

PUBLIC WORKS ENGINEERING

CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 206:	Foundation Engineering
CE 208:	Rock Engineering
CE 211:	Waste Water Treatment
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 214:	Design of Dams

* For Geology course descriptions, see the *Undergraduate and Graduate Bulletin*.

CE 215: Urban Construction Technology
CE 216: Advanced Hydrology
CE 220: Urban Transportation Engineering
CE 221: Pavement and Runway Design
CE 237: Advanced Sanitary Engineering Design
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 276: Water Resources Planning and Control
CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EAd 204: Administration of Engineering Contracts
EAd 210: Engineering Law
EAd 241: Construction Management I
EAd 242: Construction Management II
EAd 243: Construction Management III
EAd 261: Economic Analysis in Engineering Planning

SOLID MECHANICS AND MATERIALS ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 207: Soil Dynamics
CE 209: Theoretical Soil Mechanics
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EngS 215: Advanced Strength of Materials
EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 229: Transformations in Materials
EngS 230: Deformation of Materials
EngS 231: Structure of Materials
EngS 233: Mechanics of Composite Materials
*EngS 234: Composite Materials
EngS 236: Experimental Techniques in Materials Science
EngS 237: Environmental Effects on Materials I
EngS 238: Environmental Effects on Materials II
EngS 240: Fracture Mechanics

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

EngS 241: Fatigue and Failure of Materials
EngS 242: Materials Recycling and Recovery
*EngS 249: Special Topics in Materials Science
EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 298: Research
EngS 299–300: Thesis Research
EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 280: Advanced Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 295: Statistical Thermodynamics
ME 310: Mechanics of Non-Newtonian Fluids

STRUCTURAL ENGINEERING (INCLUDING COMPUTER-ORIENTED ENGINEERING DESIGN)

ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 206: Foundation Engineering
CE 210: Methods of Structural Analysis
CE 215: Urban Construction Technology
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 261: Analysis of Plates and Shells
CE 262: Design of Plate and Shell Structures
CE 263: Theory of Structural Stability
CE 298: Research
CE 299–300: Thesis Research
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 215: Advanced Strength of Materials
EngS 221: Theory of Elasticity I
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 240: Fracture Mechanics
EngS 241: Fatigue and Failure of Materials

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics

STRUCTURES AND DYNAMICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EE 157: Machine and Assembly Language Programming
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 234: Composite Materials
EngS 259: Random Vibration of Structures
*EngS 281: Advanced Programming Techniques for Engineering Mechanics Problems
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
*EngS 286: Analysis and Design of Thin-walled Structures
*EngS 287: Automated Design of Complex Structures
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 299–300: Thesis Research
EngS 314: Advanced Numerical Methods in Engineering
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 223: Aeroelasticity
*ME 248: Seminar: Aircraft Design I
OR 251: Linear Programming
OR 252: Nonlinear Programming

TRANSPORTATION ENGINEERING

Option 1: Technology of the Vehicle

CE 201: Design of Metal Structures
CE 210: Methods of Structural Analysis
CE 220: Urban Transportation Engineering
CE 252: General Structural Dynamics

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 261:	Analysis of Plates and Shells
CE 263:	Theory of Structural Stability
EngS 241:	Fatigue and Failure of Materials
EngS 251–52:	Transportation Workshop
EngS 260:	Random Process Theory in Engineering
ME 215:	Theory of Vibrations
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 222:	Applied Fluid Dynamics
ME 223:	Aeroelasticity
ME 225:	Turbomachinery I
ME 226:	Turbomachinery II
ME 237:	Propulsion I
ME 241:	Engineering Systems Design
ME 243:	Advanced Mechanical Engineering Design
ME 246:	Electromechanical Control Systems
ME 251:	Advanced Electromechanical Control Systems
ME 255–56:	Urban Transportation Technology
ME 275:	Stability and Control of Vehicles
ME 286:	Special Topics in Mechanical Engineering
ME 298:	Research
ME 299–300:	Thesis Research
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research
*U&RP 208:	Urban Transportation Planning
*U&RP 209:	Urban Transportation Models

Option II: The Way (Route Structures and Facilities)

CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 204:	Applied Soil Mechanics I
CE 205:	Applied Soil Mechanics II
CE 206:	Foundation Engineering
CE 207:	Soil Dynamics
CE 209:	Theoretical Soil Mechanics
CE 210:	Methods of Structural Analysis
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 219:	Groundwater and Seepage
CE 220:	Urban Transportation Engineering
CE 221:	Pavement and Runway Design
CE 222:	Stations and Terminals
CE 223:	Traffic Engineering
CE 250:	Advanced Metal Structures
CE 251:	Advanced Reinforced Concrete Structures
CE 252:	General Structural Dynamics
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 255:	Coastal Processes
CE 256:	Introduction to Ocean and Coastal Engineering
CE 257:	Harbor and Coastal Engineering I
CE 258:	Harbor and Coastal Engineering II
CE 259:	Random Vibration of Structures

* For Urban and Regional Planning course descriptions, see the *Undergraduate and Graduate Bulletin*.

CE 282: Hydraulic Modeling
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EngS 240: Fracture Mechanics
EngS 241: Fatigue and Failure of Materials
EngS 251–52: Transportation Workshop
EngS 298: Research
EngS 299–300: Thesis Research
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 255–56: Urban Transportation Technology
OR 231: Theory of Traffic Flow
*U&RP 208: Urban Transportation Planning
*U&RP 209: Urban Transportation Models

Option III: Transportation Systems†

CE 220: Urban Transportation Engineering
CE 223: Traffic Engineering
EAd 281–82: Systems Analysis and Management
EngS 251–52: Transportation Workshop
ME 255–56: Urban Transportation Technology
ME 298: Research
ME 299–300: Thesis Research
OR 201: Survey of Operations Research Methods I
OR 231: Theory of Traffic Flow
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
*U&RP 201: Introduction to Urban and Regional Planning
*U&RP 206: Community Facilities Planning
U&RP 208: Urban Transportation Planning
* U&RP 209: Urban Transportation Models

Civil Engineering Graduate Courses

201 Design of Metal Structures (3)

Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent. (Spring)

202 Design of Reinforced Concrete Structures (3)

Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent. (Fall)

* For Urban and Regional Planning course descriptions, see the *Undergraduate and Graduate Bulletin*.

† Prerequisite courses for admission to this option are ApSc 115 and Stat 191 (see the *Undergraduate and Graduate Bulletin*).

203 Prestressed Concrete Structures (3)

Structural behavior and failure modes of prestressed concrete structures design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 202 or equivalent. (Spring)

204 Applied Soil Mechanics I (3)

Theories of soil strength; bearing capacity of shallow foundations and their design; deep foundations, including pile types and design criteria; theories of lateral earth pressure with applications; stability analyses of slopes. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Spring)

205 Applied Soil Mechanics II (3)

Nature of soil, including geological and pedological aspects; flow of water in soil; seepage involving foundations, dams, and wells; stress distribution in earth masses; one- and three-dimensional theories of consolidation; analysis of settlement. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Fall)

206 Foundation Engineering (3)

Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of Department. (Spring)

207 Soil Dynamics (3)

Stress-strain behavior of soil under transient and repeated loads, effects of earthquakes upon foundations and earth dams, design of machinery foundations. Prerequisite: CE 204. (As arranged)

208 Rock Engineering (3)

Classification and properties of rock; nature of rock masses and rock discontinuities; field exploration; methods of excavation; design and applications to foundation slopes, tunnels, and chambers in rock. Prerequisite: approval of Department. (As arranged)

209 Theoretical Soil Mechanics (3)

Advanced theories of consolidation. Yield condition in soils. Application of theories of plasticity in soil mechanics. Elements of wave propagation in soils, including surface waves. Prerequisite: ApSc 213, and CE 204 or 205. (As arranged)

210 Methods of Structural Analysis (3)

Modern methods of analysis of statically indeterminate structures, matrix analysis based on flexibility, stiffness, energy and variational methods, substructuring techniques; consideration of plastic collapse of structures; introduction to the finite element method. Prerequisite: graduate status. (Fall)

211 Waste Water Treatment (3)

Characteristics of waste, some important pollution indicators, fundamentals of biochemical engineering for waste control, physical unit operations, chemical and biological unit processes, design of treatment facilities. Prerequisite: CE 197 or equivalent. (Fall)

212 Open Channel Flow (3)

Types and regimes of flow; energy and momentum principles, uniform flow, gradually varied flow, spatially and rapidly varied flow. Flow in non-prismatic channels. Unsteady flow; dam break problem, flood routing. Prerequisite: CE 193 or ME 221. (Fall)

213 Hydraulic Structures (3)

Forces on structures and hydraulic design criteria. Design of conveyance, diversion, cross drainage, protective and water measurement structures. Prerequisite: CE 212 or approval of Department. (Summer)

214 Design of Dams (3)

Project planning and investigations. Types of dams; design of earth-rock fill dams and concrete gravity dams. Design of outlets, spillways, and appurtenances. Construction methods for dams. Reservoir sedimentation. Safety inspection of dams. Prerequisite: CE 193 or graduate status. (Spring, even years)

215 Urban Construction Technology (3)

Precedents and contemporary trends in urban housing, building, and planning technology. Prerequisite: approval of Department. (Spring)

216 Advanced Hydrology (3)

Precipitation, evaporation, and transpiration. Soil physics; stream flow, drainage basins, hydrograph analysis, and stream-flow routing. Design criteria, flood frequency statistics and analysis, flood forecasting and control, water supply forecasting. Prerequisite: CE 195 or equivalent. (Spring)

219 Groundwater and Seepage (3)

Permeability theory of groundwater flow, flownets, analogs, computer solutions; applications to engineering problems such as excavation dewatering, flow through dams, stabilization of earth slopes. Prerequisite: ApSc 211; concurrent registration: ApSc 213. (Fall)

220 Urban Transportation Engineering (3)

Introduction to urban transportation planning. Analysis of urban transportation requirements. Evaluation procedure for the selection between alternative solutions. Prerequisite: approval of Department. (Fall)

221 Pavement and Runway Design (3)

Pavement types, wheel-load characteristics; stresses in pavements and subgrades; empirical methods of design of flexible and rigid highway and airfield pavements; general principles of runway design. Prerequisite: CE 202, and 204 or 205. (Spring)

222 Stations and Terminals (3)

Unified treatment of the functions and operation of stations and terminals of transportation systems; emphasis on specifications and planning criteria. Problems of locating the facility, passenger and freight handling, intra-modal and inter-modal interfacing, communication and control. Illustrations include railroad and subway stations, bus terminals, airports, and harbors. Prerequisite: approval of Department. (Spring)

223 Traffic Engineering (3)

Roadway traffic capacity and other road network performance meas-

ures; methods of characterizing steady and unsteady traffic flow phe-
nomena; traffic behavior monitoring techniques, instruments, and data
processing; impact of vehicle and operator dynamics on traffic flow
behavior; road bottleneck flow dynamics; traffic control signalization
theory and practical implementation; traffic signal control systems for
conventional street networks and limited access expressways; examples
of traffic control system implementations. Prerequisite: approval of De-
partment. (Fall)

237 **Advanced Sanitary Engineering Design** (3)

Basic principles and practical considerations; hydraulic and structural re-
quirements; basic parameters and elements of design; layout and design
of water supply and sewage systems, pumping stations, and wastewater
treatment plants; development of design parameters; cost and financing;
existing plant expansions. Prerequisite: graduate status. (Fall)

240 **Environmental Microbiology** (3)

Basic cellular organizations and processes related to waste treatment;
microorganisms as disease-carrying agents in natural and waste water;
laboratory tests for coliform organisms and viruses, and analysis of acti-
vated sludge. (Fall)

241 **Environmental Chemistry** (3)

Chemical composition and chemical analysis of water; chemical treatment
of water and waste water; laboratory tests of solids, BOD, COD, phos-
phorus, nitrogen, etc., as related to water quality. (Spring)

242 **Solid Waste Disposal** (3)

Characteristics of solid waste; collection, transportation, and disposal prac-
tices; regional planning and management; resource and energy recovery
from solid waste. Prerequisite: approval of Department. (Fall)

243 **Environmental Impact Assessment** (3)

Public policy and legislation at federal, state, and local levels concerning
quality of the environment. Strategies and methodologies which have been
developed to assess impact of engineering projects. Technology of assess-
ing impact on air and water quality and on land use, applied to transpor-
tation facilities, water supply and pollution control facilities, and indus-
trial and community development. Prerequisite: approval of Department.
(Fall)

250 **Advanced Metal Structures** (3)

Conception, analysis, and design of low-rise and high-rise buildings by elas-
tic and inelastic methods, suspended roofs, earthquake considerations, and
unique structural systems. Prerequisite: CE 201 or equivalent. (Fall)

251 **Advanced Reinforced Concrete Structures** (3)

Conception, analysis, and design of low-rise and high-rise buildings by ulti-
mate strength methods, precast systems, progressive collapse, earthquake
considerations, domes, folded plates, shell-type structures and special topics.
Prerequisite: CE 202 or equivalent. (Spring)

252 **General Structural Dynamics** (3)

Analysis of single and multiple degree of freedom structural system un-
der steady-state and transient loads; response of discretized structural
systems, such as rigid frames, plates, and thin shells under dynamic
loads, including earthquakes, wind, and blastic loading; introduction to

probabilistic methods in structural dynamics. Prerequisite: ApSc 115, CE 210, or equivalent; and approval of Department. (Spring)

253 **Failure and Reliability Analysis of Engineering Structures** (3)

Operational and structural failure mechanisms; instability, fracture, and fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and reliability, optimal design criteria. Prerequisite: ApSc 115 or equivalent. (Fall)

254 **Special Topics in Structural Engineering** (3)

Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3) structural design for dynamic loads, (4) structural design for repeated loads, or (5) structural synthesis and optimization. May be repeated for credit. Prerequisite: CE 210 and approval of Department. Topic to be announced in the *Schedule of Classes.* (As arranged)

255 **Coastal Processes** (3)

Longshore currents and nearshore circulation; coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport of sandy dune stabilization, sediment tracing. Prerequisite: approval of Department. (Spring)

256 **Introduction to Ocean and Coastal Engineering** (3)

Application of wave mechanics to the analysis of wave motion in coastal and offshore regions: reflection, diffraction, refraction. Wave spectra: procurement of spectral data by direct measurement or from hind-casting techniques. Beaches and littoral drift, mixing processes, outfalls and intakes in the oceans and estuaries, wave forces on coastal and offshore structures, harbor oscillations, tides in estuaries. Prerequisite: ApSc 115, ME 221; or equivalent. (Fall)

257 **Harbor and Coastal Engineering I** (3)

Waves and swells, tides and currents, coastal regime, estuaries and deltas, structures for coastal protection, principles of harbor navigation, harbor planning and harbor design, breakwaters and sea walls, quays, docks, internal access structures; maintenance of external and internal access, dredging. Prerequisite: CE 256. (Spring)

258 **Harbor and Coastal Engineering II** (3)

Interaction between structures and waves. Analysis and design of flexible structures: piers, jetties, and protective structures; off-shore drilling platforms. Design criteria, moorings and cables, harbor operations equipment. Prerequisite: CE 252 or equivalent; CE 257. (Fall)

261 **Analysis of Plates and Shells** (3)

Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status. (Spring)

262 **Design of Plate and Shell Structures** (3)

Design of long-span plate and shell roof structures in reinforced concrete

and metal; design of containers for fluids and granular materials; computer applications in the analysis of such structures. Prerequisite: CE 201, 202, 261; or equivalent. (Fall)

263 **Theory of Structural Stability** (3)

General criteria for stability; buckling of elastic and inelastic columns and frames; torsional and lateral buckling; variational methods. Buckling of plates and shells under static loads; stability of stiffened structures; effects of imperfections and boundary conditions. Prerequisite: graduate status. (Fall)

265 **Special Topics in Geotechnical Engineering** (3)

Selected topics such as rheology of soils, computer applications, excavation and tunneling, ocean engineering problems, or other special topics. May be repeated for credit. Prerequisite: approval of Department. (As arranged)

271 **Theoretical Marine Hydromechanics** (3)

Introductory course designed to acquaint the student with some physical concepts and mathematical tools of theoretical marine hydromechanics. Derivation of the fundamental equations and boundary conditions of a fluid media; application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of Department. Offered off-campus only. (As arranged)

272 **Advanced Waste Treatment Process Design** (3)

Pre-design considerations; application of kinetics to treatment processes; reactor types and flow characteristics; theory of continuous culture; general considerations of activated sludge processes for industrial waste treatment; miscellaneous topics. Prerequisite: CE 211 or equivalent. (Spring)

274 **Mechanics of Water Waves** (3)

Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state-of-the-art based on correlation between theory and measurements. Wave-breaking and reflexion. Prerequisite: ME 221 or equivalent and permission of instructor. (Fall)

275 **Special Topics in Ocean Engineering** (3)

Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of Department. (Spring)

276 **Water Resources Planning and Control** (3)

The parameters of water resources planning and control; economics of water resources and related natural resources; economics of water quality control; physical parameters of water resource development; water resources law. Prerequisite: approval of Department. (Fall)

277 **Industrial Waste Treatment** (3)

The nature of industry and waste generation; industrial waste characteristics; waste measurements; techniques utilized in industrial waste treat-

ment and control; nuclear waste control; reuse of industrial effluents and sewage for industrial process water; problems associated with treatment and disposal of industrial wastes and their effects on receiving waters. Prerequisite: CE 211 or equivalent. (Fall)

278 **Pollution Transport System** (3)
Distribution of pollutants in natural waters and atmosphere; diffusive and advective transport; mathematics for stream pollutant deoxygeneration rates; groundwater pollution transport; sediment transport; thermal transport; numerical simulation of pollutant transports in streams and estuaries. Prerequisite: CE 193, ME 131. (Fall)

280 **Water Resources Systems** (3)
Water resources planning and control; water quality planning, water supply planning, comprehensive planning and management. Case studies of systems. Prerequisite: CE 276. (Spring)

281 **Special Topics in Water Resources** (3)
Selected Topics: morphometric properties of drainage basins; drainage network analysis; hydraulic geometry of streams; advanced hydraulics of alluvial channels; modeling of drainage basins; computer applications; stochastic hydrology. Prerequisite: approval of Department. (As arranged)

282 **Hydraulic Modeling** (3)
Dimensional analysis and similitude. Types of models; physical models, mathematical models. Distortions in physical models. Erodible bed models. Prerequisite: CE 193 or ME 221 or graduate standing. (Spring, odd years)

298 **Research** (arr.)
Basic research projects, as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

310 **Sedimentation Engineering** (3)
Problems of erosion and sedimentation. Properties of sediment. Initiation of motion. Suspension of sediment and sediment discharge theories. Sedimentation measurements. Economic and legal aspects. Prerequisite: CE 212 or approval of Department. (Fall)

311 **Mechanics of Alluvial Channels** (3)
Physical processes in drainage basins and channels. Channel forms and bed forms. Hydraulics and sediment transport in alluvial channels. Design of stable channels. Qualitative and quantitative response of rivers. Channel stabilization, navigation channels. Case studies including environmental impacts. Prerequisite: CE 212 or approval of Department. (Spring)

312 **Advanced Hydraulics** (3)
Continuity, energy, and momentum equations. Turbulence, diffusion, and dispersion. Cavitation, waves, subsurface flow. Special problems in flow through hydraulic and marine structures. (Summer)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Mechanical Engineering Graduate Courses

204 **Advanced Instrumentation Techniques** (3)

Pressure and temperature sensors; shadowgraph, schlieren and interferometer systems; laser holography; laser doppler velocimetry; signal conditioning, use of amplifiers with shielding and grounding techniques; digital techniques; signal multiplexing; use of computers; error analysis and data handling. Lecture and laboratory. Prerequisite: approval of Department. (Fall)

215 **Theory of Vibrations** (3)

Damped and undamped natural vibrations, transient response and response to harmonic and periodic excitation, natural vibration of discrete and continuous systems; integral formulation of eigenvalue problems, response by modal analysis, approximate methods, influence of secondary effects and constraints, damped systems. Prerequisite: approval of Department. (Fall)

216 **Structural Dynamics** (3)

Methods of solving vibration problems: differential equation, Rayleigh-Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: ME 215. (As arranged)

218 **Design of Floating and Submerged Marine Vehicles** (3)

Consideration of interaction between hydrodynamics, propulsion, and configuration aspects of design of floating structures and vehicles; effects of submergence and deep submergence; hydrofoil and vertical jet action, structural considerations. Prerequisite: EngS 228. (Fall)

221 **Intermediate Fluid Mechanics** (3)

The continuum, kinematics of fluids; stress tensor, strain and rate-of-strain tensor; fundamental equations of the flow of viscous compressible fluids; Laplace's equations; source, sink, and doublet; vortices, Biot-Savart theorem and the flow field of a vortex; spherical and cylindrical harmonics, methods of singularity distributions, complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of Department. (Fall)

222 **Applied Fluid Dynamics** (3)

Subsonic lifting line wing theory, direct and inverse solution of the lifting surface theory; singularity method for wing-body combination; vortex lift theory; effects of camber and twist distribution; transonic airfoils, effect of wing sweep, area ruling concept; supersonic linearized wing theory; similarity rules. Prerequisite: ME 221 or equivalent. (Spring)

223 **Aeroelasticity** (3)

Introduction to aeroelastic phenomena; structural deformations of vehicles under static and dynamic loads; vibrations of vehicle structures; static aeroelastic problems (structural deformation, divergence, control effective-

ness, and reversal); flutter theory and calculation of flutter boundaries; aerodynamics of steady and nonsteady two-dimensional wings in subsonic, sonic, and supersonic flow; strip theory applications of two-dimensional aerodynamics to three-dimensional lifting surfaces; piston theory and Newtonian-flow theory. Prerequisite: ME 215, 221; or equivalent. (Fall)

224 **Fundamentals of Combustion Engines** (3)

Classification of combustion engines: air cycles, vapor cycles, external combustion engines, internal combustion engines; rotary engines, reciprocating engines, and turbomachinery; ideal cycle analysis; engine heat losses and friction; practical cycle analysis status of computerized cycle analysis; combustion and knocking; carburetion and fuel injection; mixture distribution; valve mechanism; ignition systems; combustion chamber; piston-engine, rotary-engine, and turbomachinery mechanics and balance. Prerequisite: approval of Department. (Fall)

225 **Turbomachinery I** (3)

Turbine, compressor, and pump types and uses; dimensional analysis of turbomachines; cycle analysis of gas and steam turbines; energy interchange in fluid machinery; design, characteristics, and performance of turbines, compressors, and pumps; comparison of types of turbines, compressors, and pumps. Prerequisite: ME 221. (Fall)

226 **Turbomachinery II** (3)

Aerodynamics of aerofoils, flow in cascades, axial compressor aerodynamic design, axial turbine aerodynamic design, compressor and turbine matching. Combustion fundamentals, combustion chemistry, and gas turbine combustion chamber design. Prerequisite: ME 225. (Spring)

227 **Viscous Flow** (3)

Exact solutions of Navier-Stokes equations; the small Reynolds number approximations, laminar boundary-layer theory and the techniques for its solution, stability of laminar flows; Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory; applications to heat transfer problems; flow separation. Prerequisite: ApSc 213; and ME 221 or equivalent. (Fall)

231 **Hydrodynamics** (3)

Flow at large Reynolds number: vorticity dynamics, Kelvin's theorem in inviscid flow, vorticity in motions generated from rest, boundary layers, applications of the momentum theorem. Irrotational flow theory: applications of Bernoulli and momentum theorems to steady flows, flow due to a rigid body, two-dimensional motion and applications of complex variable theory, free surface flows, Froude numbers, criterion of dynamic similarity. Effectively inviscid flow with vorticity: sheet vortex, flow with swirl, vortex system of a wing. Prerequisite: ME 221 or equivalent. (Spring)

235 **Compressible Flow** (3)

Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock wave interactions, holograph transformation, Kármán-Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; and ME 221 or equivalent. (Spring)

237 Propulsion I (3)

Basic concepts of propulsion: energy transformations in propulsive flows; gas dynamics of combustion, detonation processes; nonuniform flows, mixing; intakes, additive drag; mechanics of flow induction; drag and thrust generation; multiple-flow thrust generators; thrust recovery and augmentation; the propulsion spectrum. Illustrative examples will include propellers, turbojets, turbofans, ramjets, and rockets. Prerequisite: approval of Department. (Spring)

238 Propulsion II (3)

Advanced concepts of air and marine propulsion. Wave processes; static, dynamic, and crypto-steady pressure exchange; energy equalizers and dividers; non-steady flow thrust generators. Topics for discussion will include a variety of flow induction and propulsion concepts. Prerequisite: ME 237 or equivalent. (Fall)

240 Kinematic Synthesis (3)

Techniques for the analysis and synthesis of function, path, and motion generating mechanisms. Algebraic and graphical methods for the dimensional design of mechanisms having prescribed performance characteristics. Design for higher-order requirements. Computer-aided techniques for the optimal design of planar linkages using Burmester theory, complex number stretch-rotation operators, Chebyshev polynomials, etc. Discussion of spatial mechanisms analysis and design using matrix and tensor methods, dual angles, dual vectors, quaternion algebra, and dual quaternions if time permits. Review of recent developments and current research. Term project.

241 Engineering Systems Design (3)

Principles of systems design; interdisciplinary system simulation for mechanical, electrical, fluid, and thermal sciences; dynamic response of systems; mathematical model and analogy studies; optimization techniques with computer-aided solutions. Prerequisite: approval of Department. (Fall)

243 Advanced Mechanical Engineering Design (3)

Reduction of physical and engineering systems to simplified physical and mathematical models; representation using networks, linear graphs, reticular geometry and finite element methods. Optimization techniques. Manipulation of the resulting models using digital algorithms. Examples drawn from fields primarily of interest to scientists and engineers, with some attention to styles of problem solving. Elements of automatic computation with emphasis on applications using FORTRAN as a programming language. Working knowledge of FORTRAN recommended.

246 Electromechanical Control Systems (3)

System synthesis, compensation, and stabilization using Bode diagrams, root locus, etc.; linear and nonlinear characterization of mechanical, electromechanical, and electronic control components. Prerequisite: approval of Department. (Fall)

247 Fluidics (3)

Introduction of fluidic components and systems: behavior and modeling of bistable and proportional jet devices, vortex amplifiers and sensors, passive elements, transmission lines; system synthesis, coupling effects. Survey of current applications and research. Prerequisite: approval of Department. (Spring)

*248 **Seminar: Aircraft Design I** (3)

Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of Department. (As arranged)

*249 **Seminar: Aircraft Design II** (3)

Aircraft design in relation to prescribed mission requirements, different configurative concepts, detail design features. Estimation of weight, size, and power of an aircraft to satisfy mission specifications; design tradeoffs and compromises. Emphasis on subsonic aircraft for steady cruising flight missions. Jet-powered and propeller-driven aircraft; supersonic cruising aircraft. Prerequisite: approval of Department. (Spring)

251 **Advanced Electromechanical Control Systems** (3)

Time domain analysis and design of electromechanical control systems using state space methods and matrix differential equation techniques. Advanced stability analysis and design optimization techniques for both linear and nonlinear systems. Examples taken from practical mechanical components and systems including continuous and discrete time systems. Introduction to electromechanical switching system theory and practice. Prerequisite: ME 246. (As arranged)

254 **Intermediate Heat and Mass Transfer** (3)

Fundamentals of heat and mass transfer, its laws and properties. Conduction equations and solutions for steady and transient cases. Convection of heat and mass. Dimensionless numbers and boundary layer concepts. Laminar, transition, and turbulent flows. Radiation in transparent media and at surfaces. Application to combustors and solar devices. Prerequisite: ApSc 213. (Spring)

255 **Urban Transportation Technology** (3)

An introduction to the technical evaluation of alternative transportation modes including bus, rail, and new technology. Includes system operations, energy and environmental impacts, route constraints, suspension and switching systems, life cycle costs, and measures of system effectiveness. Prerequisite: approval of Department. (Fall)

257 **Energy Technology I**

An overall view of energy technology, supply and demand, and the relation among energy, environment, and institutional problems. Regression analysis, forecasting of supply and demand, energy systems modeling, analysis of cycles, Second Law analysis, nuclear energy, and energy transmission. Prerequisite: approval of Department. (Fall)

258 **Energy Technology II**

Continuation of ME 257. Various forms of solar energy (e.g., heating and cooling, photovoltaics, wind, biomass, ocean thermal gradients), tidal energy, geothermal energy, energy and food production, energy systems design, and energy policy. Prerequisite: ME 257. (Spring)

259 **Solar Heating and Cooling Systems** (3)

Availability of solar energy, climatic data for solar heating and cooling.

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

System description, solar collector, thermal energy storage, auxiliary energy source; system performance requirements. Subsystems evaluations, collector performance analysis, collector fluid loop optimization, thermal energy storage requirements. System configurations and modeling, control system requirements. Estimation of the total life-cycle costs for selected solar heating and cooling systems. Architectural features and considerations. Prerequisite: approval of Department. (Fall)

260 **Heating, Refrigeration, and Air Conditioning** (3)
Fluid flow and heat transfer; heating and cooling load calculations; design of heating and cooling distribution systems; design and characteristics of evaporator, condenser, expander, and compressor. Methods of refrigeration and air conditioning: vapor-compression refrigeration, absorption refrigeration, steam jet refrigeration, thermo-electric refrigeration, low-temperature refrigeration, heat pumps, basic air-standard cycles, regenerative and bootstrap air cycles. Method of heating: warm-air, hot-water, electric-resistance, and solar heating systems and heat pumps. Prerequisite: approval of Department. (Spring)

261 **Fundamentals of Environmental Control I** (3)
Understanding environmental systems, water as natural resources, air as an ecological limiting factor, man's inadvertent modification of weather and climate, solid wastes, noise, pesticides, and radiation, natural resources, utilization of terrestrial ecosystems, international cooperation, citizen participation, environmental needs. Prerequisite: approval of Department. (Fall)

262 **Fundamentals of Environmental Control II** (3)
Directed field investigations; case studies and workshops to document ecological problems associated with power plants, power plant site selection, impoundments, and industrial discharges as they relate to the current National Environmental Policy Act of 1970 and the anticipated future national policies. Prerequisite: ME 261 or equivalent. (Spring)

263 **Environmental Control Processes I** (3)
Control of particulates emissions: settling, filtration, cyclonic collection, wet collection, and electrostatic precipitation. Control of gaseous emissions: absorption, adsorption, incineration, and condensation. Design, operation, and current status of air-pollution control processes. Prerequisite: approval of Department. (Spring)

264 **Environmental Control Processes II** (3)
Selected problems in the application of mechanical engineering science to the design of environmental control equipment, *i.e.*, theory of vortex flow, design of vortex equipment for separation of solid and oil suspensions from water; mechanics of air bubbles in water, mechanical generation of air bubbles, design of turbine, jet diffuser, and porous diffuser for aeration systems; thermodynamics and kinetics of combustion, application of combustion theory to design of incineration systems for sludge and solid disposal; theory of mass transfer and its application to hyperfiltration systems. Prerequisite: ME 261, 262; or equivalent. (Fall)

265 **Air-pollution Meteorology** (3)
Weather and motion systems of atmosphere; ground- and upper-level air conditions; atmospheric stability and inversions; atmospheric turbulence and diffusion; urban and topographic effects upon meteorological parameters; effects of meteorological parameters upon transportation and diffusion of pollutants; meteorological factors in plant location, design, and opera

tion, and in urban planning. Prerequisite: ME 221 or equivalent. (Fall)

266 **Experimental Methods for Environmental Control** (3)

Theory and reference methods for air pollutants analysis, instrumentation for air pollutants monitoring, sampling, and analysis; theory and devices for thermal environmental control systems. Guided laboratory projects and experiments. Prerequisite: ME 260, 261; or equivalent. (Spring)

*270 **Aerodynamics of Flight Vehicles** (3)

Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: ME 222 or equivalent. (Spring)

*271 **VTOL Aircraft Technology** (3)

Fundamental principles of VTOL aircraft; hovering performance based on momentum theory; analysis of jet-induced interference effects; transition aerodynamics; theoretical stability and control and correlation with flight data; ground-effect theory and experiment; handling qualities criteria; elements of instrument approach and landing problem. Prerequisite: approval of Department. (Spring)

*272 **Powered-Lift Technology** (3)

(Formerly STOL Aircraft Technology)

Basic principles of powered-lift aircraft; high-lift aerodynamics; low-speed stability and control; fundamentals of internally blown and externally blown powered-lift concepts; the spanwise blowing scheme to delay wing stall; use of powered-lift for improved maneuverability of fighter aircraft; aerodynamic ground effects; alleviation of noise of powered-lift systems; aerodynamic loads associated with blown flaps. Prerequisite: approval of Department. (Fall)

*273 **Principles of Automatic Flight Control** (3)

Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of Department. (Fall)

*274 **Principles of Flight Guidance** (3)

Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273. (Fall)

275 **Stability and Control of Vehicles** (3)

Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques, and frequency response analysis. Prerequisite: approval of Department. (As arranged)

*276 **Mechanics of Space Flight** (3)

First- and second-order Hamilton-Jacobi perturbation theory applied to artificial satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

of various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of Department. (As arranged)

*277 **Numerical Methods in Fluid Mechanics** (3)

Numerical solution of partial differential equations of fluid flow; finite-difference techniques for viscous and inviscid flows; stability; methods of characteristics; boundary conditions; applications in subsonic and supersonic flows. Prerequisite: ApSc 213, EngS 284; or equivalent. (As arranged)

*278 **Performance, Stability, and Control of Helicopters** (3)

Development of rotor blade theories; actuator disc, blade element, vortex theory. Hovering and climb performance, autorotation and forward flight performance. Rotor system mechanics, flapping motion of articulated and semi-rigid rotors, blade motions in plane of rotation. General performance and design considerations. Stability and control in hovering and forward flight, damping in pitch and roll, static stability with speed and angle of attack. Prerequisite: ME 222, 275. (Spring)

*279 **Special Topics in Flight Sciences** (3)

Current problems and methods in high angle of attack stability and control. Nonlinear aerodynamics in the angle of attack region above the stall. Influence of aircraft design and nonlinear aerodynamics parameters on the poststall stability and control of aircraft. Employment of current experimental techniques and development of equations pertaining to developed spin and recovery characteristics. Prerequisite: ME 275 or approval of Department. (Spring)

280 **Advanced Thermodynamics** (3)

Statistical significance of the entropy concept, conditions of equilibrium, equilibrium of heterogeneous systems. Application of thermodynamic formalism to magnetic, electric, and solid systems; equilibrium of ionized gases; the Nernst postulate and the third law of thermodynamics. Prerequisite: graduate status. (Fall)

281 **Nonequilibrium Thermodynamics** (3)

Limitations of equilibrium thermodynamics, entropy production, phenomenological equations and linear laws; postulates of nonequilibrium thermodynamics, formulation of the equations of nonequilibrium systems, statistical foundations, stationary nonequilibrium states; selected applications. Prerequisite: ME 280. (Spring)

282 **Fossil Fuels** (3)

(Formerly Energy Technology)

Coal, petroleum, and natural gas. Fossil fuel reserves, methodologies of estimating and exploring for fossil fuels. Geophysical, geochemical, and satellite techniques. Prerequisite: Chem 152. (As arranged)

283 **Nuclear Reactor Engineering I** (3)

World energy resources and the importance of fission energy; atomic and nuclear structure; nuclear fission and chain reaction; critical mass; nuclear reactor classification; history of reactor development; nuclear reactions and radiations; radioactive decay; radiation detection, hazards, and protection; neutron reactions; neutron diffusion and slowing down; the criti-

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

cality condition; reflected reactors; homogeneous and heterogeneous reactor systems; transient reactor behavior and control; description of pressurized and boiling water reactors; other reactor systems. Environmental considerations; reactor safety. Prerequisite: approval of Department. (Fall)

284 Nuclear Reactor Engineering II (3)

Energy removal; reactor coolants; reactor thermal hydraulics, radiation damage and reactor materials problems; reactor fuels; shielding; mechanical and structural components; preliminary reactor design; fuel cycles; description of nuclear reactor systems; engineered safety systems; the economics of nuclear power. Prerequisite: ME 283. (Spring)

***285 Reaction Kinetics (3)**

Theoretical aspects of kinetics of homogeneous and heterogenous reactions in gaseous and liquid systems. Prerequisite: ME 280. (Spring)

286 Special Topics in Mechanical Engineering (3)

Prerequisite: approval of Department. (As arranged)

287 Heat Conduction (3)

Conduction of heat through solid, liquid, and gaseous media; formulation and methods of analytical, numerical, and analog solutions; steady two- and three-dimensional problems, problems in unsteady heat conduction; conduction in composite regions. Prerequisite: ApSc 213 or equivalent. (Fall)

288 Convective Heat and Mass Transfer (3)

Heat and momentum transfer in laminar and turbulent flow; application of boundary-layer theory to problems of forced convection; the laminar boundary-layer and similarity solutions; heat convection in turbulent flow, momentum-heat transfer analogy; the influence of temperature-dependent fluid properties; convective heat transfer at high velocities; mass transfer; formulation of a simplified theory; some solutions to the conserved property equation. Prerequisite: ME 221 or equivalent. (Spring)

289 Radiative Heat Transfer (3)

Nature of thermal radiation; radiative characteristics of surfaces; thermal radiation within evacuated enclosures; configuration factors algebra; solution methods for the integral equations of radiant interchange; enclosures containing an absorbing and emitting medium; absorbing, emitting, and scattering media; combined radiation, conduction, and convection. Prerequisite: ApSc 214 or equivalent. (Fall)

***290 Kinetic Theory of Gases (3)**

Equation of state and physical properties for gas composed of discrete particles; relation of kinetic theory to thermodynamics; Maxwell distribution of molecular velocities; Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280. (Spring)

291–92 Power Systems (3–3)

Design of thermal power system components and system optimization. Steam cycle power generation system components: steam generators, re-

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

actor coolant system, condensate and feedwater system, turbine-generator, waste heat removal. Heat balance studies, options for improved cycle efficiencies, system optimization studies, component selection and design, cooling towers, lakes and ponds. Review of safety and pollution regulations; testing, inspection, and codes. Survey of electric power system technology. Prerequisite: ME 148, 187; or equivalent. (Academic year)

293 **Combustion** (3)

Basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Detonation, deflagration, diffusion flames, heterogeneous combustion. Combustion technology, computer modeling, and experimental measurements. Impact of pollution regulations and alternate fuels. Prerequisite: approval of Department. (Spring)

294 **Wind Energy** (3)

Technical and economic problems of energy extractions from wind. Examination of the morphology of conversion devices; energy extraction from a moving fluid stream; aerodynamics of rotors. Nature of the wind, its special, temporal, and terrain-dependent variables. Structural, dynamic, and electrical problems and requirements; systems tradeoffs in wind turbine design. A wind turbine will be designed. Prerequisite: approval of Department. (Fall)

295 **Statistical Thermodynamics** (3)

Distribution functions; Boltzmann, Bose-Einstein, and Fermi-Dirac statistics; partition functions, correspondence between classical and statistical thermodynamics. Systems with negligible effects of interparticle forces; perfect gases, perfect electron gas, photon gas. The Debye solid, the Einstein solid. Prerequisite: ME 280. (Spring)

296 **Special Topics in Heat and Mass Transfer** (3)

Prerequisite: approval of Department. (As arranged)

297 **Special Topics in Fluid Mechanics** (3)

Prerequisite: approval of Department. (As arranged)

298 **Research** (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)

(Fall and spring)

310 **Mechanics of Non-Newtonian Fluids** (3)

Classification of fluids; physical properties of composite fluids; convected coordinate systems; fundamentals of constitutive equations of composite fluids; purely viscous fluids, Reiner and Rivlin theories, power-law fluids, linear theory of viscoelastic fluids, Boltzmann principle, quasi-linear viscoelasticity; nonlinear theory of viscoelasticity, Rivlin-Ericksen theory; viscoplastic fluids, Bingham plastic fluids, Oldroyd's analysis; viscometry and rheogoneometry; turbulent flow of suspensions and emulsions in pipes, frictional drag reduction by polymeric additives. Prerequisite: approval of Department. (Fall)

311 **Nonsteady Flow** (3)

Eulerian and Lagrangian kinematics. Fundamental equations of nonsteady viscous flow. Characteristics and waves; initial and boundary conditions. Piston theory and the oscillating airfoil. Nonsteady flows

with entropy production. Discontinuities, interactions, and special transients. Gasdynamics of nonsteady combustion. Analogies and applications. Prerequisite: ME 235 or ME 237 or equivalent. (Fall)

312 **Theory of Turbulence** (3)
Concept of turbulence, transition and linear theory of flow stability, experimental observations on turbulence generation, turbulent kinetic energy distribution, statistical description of turbulence, energy cascade and energy spectrum in turbulence, mean turbulent energy and Reynolds stress closure models, turbulent shear flows in free turbulence and wall turbulence, turbulence in atmospherical environment and effects on air-pollution and weather systems, turbulent drag reduction. Prerequisite: ME 227. (Fall)

313 **Magnetofluidmechanics** (3)
Thermodynamics and fluid mechanics of electrically conducting liquids and gases; theory and applications; thermodynamics and transport properties of plasmas formulated; reaction kinetics and plasma reactions; fundamental equations (mass, momentum, and energy) of magnetofluidmechanics; flow with infinite and finite conductivity, Alfven waves and wave phenomena, flow with heat transfer and friction, relativistic magnetofluidmechanics, dimensional analysis and scaling parameters, applications to MHD power generators, pumps, plasma jets and propulsion, controlled thermonuclear fusion, chemical synthesis and mineral separation. Prerequisite: ME 221 and ME 280. (As arranged)

315 **Hypersonic Flow** (3)
Small-disturbance theory, Newtonian theory; constant-density solution, theory of thin shock layers, flow over blunt bodies, hypersonic viscous flow. Prerequisite: ME 227. (Fall)

317 **Physical Gas Dynamics** (3)
Molecular and atomic phenomena in gases, intermolecular forces, specific heats, equation of state for a real gas, dynamics of dissociating gas, radiation. Prerequisite: ME 235; and ME 295 or equivalent. (Spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Engineering Science Graduate Courses

201 **History of Technology I** (3)
The characteristic technologies of Prehistory, the Ancient Near East, Greece and Rome, Byzantium and Islam, and Christian Europe. Technology is broadly defined. Emphasis is on its manifold interactions with other cultural forces. (Fall)

*202 **Advanced General Metrology** (3)
Topics in the conceptual, physical, and mathematical aspects of measurement, standards, design for precision measurement, and measurement at extreme values. Prerequisite: graduate status. (Fall—evening)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

*203–4 **Probability and Statistics of Metrology** (3–3)

Probability distributions, discrete and continuous distributions; sampling, combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin Square experiments; factorial experiments; block and lattice design. Prerequisite: ApSc 115 or equivalent. (Academic year—evening)

206 **Technology and Human Needs** (3)

Sociology of science and technology, the solar systems and earth, population, nonrenewable resources, renewable resources, energy, nuclear energy, renewable energy conversion, environment, productivity, transportation. Prerequisite: approval of Department. (Fall and spring)

207 **Engineering Climatology** (3)

Constitution of physical properties of earth and atmosphere, stability conditions, energy balance characteristics, atmospheric motions, storm forecasting models, tree-ring analysis, evaporation, precipitation, fog formation, soil moisture, ground frost. Prerequisite: approval of Department. (As arranged)

208 **Energy Conservation** (3)

Methods of conserving energy without sacrificing productivity and the quality of life. Conservation methods in the home, in transportation, in industrial, manufacturing, and commercial sectors. Second law of thermodynamics from a conservation viewpoint. Construction methods for low-energy consumption in large and small edifices. Environmental effects and low-fuel consumption in ground and air transportation. Greenhouses and natural fertilizers. Prerequisite: approval of Department. (As arranged)

210 **Quantitative Aspects of Social Phenomena** (3)

Mathematical models presenting social phenomena. Historical review of attempts to quantify social phenomena. Population growth, birth and death rates; population diffusion; Lancaster equation; Richardson's approach; the Forrester-Meadows model. Kinetic theory formulation of peaceful co-existence. Probability distributions, characteristic functions and central limit theorem. Brownian motion approach to speculation and the stock market. Traffic flow, the statistical approach and Lighthill's method. Quality-of-life indicators and quantification of social indicators. Environmental modeling. Thermodynamics approach to self-rejuvenating systems and its application in government and organizations. Prerequisite approval of Department. (As arranged)

212 **Nonrenewable Resources** (3)

Interplay of geology, engineering, and economics on resources. Role of resources in society, concepts and definitions for analyzing resource issues. Mineral commodities, their world distribution, geology, production technologies and costs, transportation systems, consumption patterns, substitutes, recycling. Environmental impacts, energy requirements, needs, and problems in mineral conservation; the threat of mineral cartels. Analysis of optimistic and pessimistic forecasts of future resource depletion. Prerequisite: approval of Department. (As arranged)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

213 **Renewable Resources** (3)
Food and fiber, solar energy and radiation, photosynthesis. Agricultural and forest biomass production, seasonal availability, collection and replanting. Substitution of renewable resources for depletable. Food-energy relationship. Biological and chemical conversion processes, direct combustion, pyrolysis, enzymatic hydrolysis, and hydrogenation. Economics of scale and life cycle cost of conversion systems. Environmental and socio-economic impacts of alternative land usage. Institutional barriers. Prerequisite: approval of Department. (As arranged)

214 **Geothermal Energy** (3)
Geothermal energy due to thermal gradients in the earth, fundamentals of geological gradients, geographic location of potential geothermal energy sources, comparison of methods of exploration and study of steam and hot rock systems. Generation of electricity from geothermal sources. Obtaining hot water process heat. Equipment design. Environmental effects and means of mitigating adverse conditions. Prerequisite: approval of Department. (As arranged)

215 **Advanced Strength of Materials** (3)
Advanced problems of stress and strength analysis of structural and machine elements: bending, torsion and buckling of thin-walled structures. Curved beams, stress-concentrations, thermal stresses, creep instability and stress relaxation, contact problems, composite elements. Prerequisite: approval of Department. (Spring)

*217 **Analytical Mechanics** (3)
Fundamental principles, generalized coordinates, variational principles and Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Prerequisite: approval of Department. (Spring)

218 **Introduction to Continuum Mechanics** (3)
Kinematics of a continuum, equations of motion, linear isotropic elastic solid, Newtonian viscous fluid, integral formulation of general principles, simple applications. Prerequisite: approval of Department. (Fall)

221 **Theory of Elasticity I** (3)
Introduction to Cartesian tensor analysis; deformation, stress, linear constitutive relations, formulation of boundary value problems, variational principles; torsion and bending of prismatical rods, plane problems in elastostatics. Prerequisite: approval of Department. (Fall)

222 **Theory of Elasticity II** (3)
Application of integral transforms and analytic function theory to solution of plane problems in static and dynamic elasticity. Introduction to three-dimensional elastostatics. Prerequisite: EngS 221, ApSc 211. (Spring)

228 **Physical Oceanography** (3)
Seawater, equations of motion, interaction between air and sea, currents, wind-waves in deep and shallow waters, long ocean waves, tides, wave-statistics, sea ice. Prerequisite: ME 221 or equivalent. (Spring)

229 **Transformations in Materials** (3)
Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: approval of Department. (Spring, odd years)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

230 Deformation of Materials (3)

Dislocation geometry, stress field of dislocations, forces on a dislocation, dislocation reactions, dislocation dynamics, yield, plastic flow, work hardening, recovery, solid solution hardening, precipitation and dispersion hardening, mechanisms of creep, yield, and fracture. Prerequisite: approval of Department. (Fall, odd years)

231 Structure of Materials (3)

Space lattices, crystal structures, planes, directions, anisotropy, texture and preferred orientations, stereographic projections, Bragg's law, Laue techniques, moving crystal diffraction, Debye-Scherrer method, X-ray spectrometry, electron microscopy, bonding energy of crystals, lattice energy, lattice vibrations, free electron theory, zone theory, alloy theories, conductors, insulators and semiconductors, magnetism, resistivity, defects in metals. Prerequisite: approval of Department. (Fall, even years)

233 Mechanics of Composite Materials (3)

Stress-strain relationship for orthotropic materials; invariant properties of an orthotropic lamina; biaxial strength theory for an orthotropic lamina; mechanics of materials approach to stiffness; elasticity approach to stiffness; classical lamination theory; strength of laminates; statistical theory of fatigue damage for composites. Prerequisite: approval of Department. (Spring)

234 Composite Materials (3)

Principles of composites and composite reinforcement; micromechanics and failure; interface reactions in various composites; reinforcing materials; structure of composites—fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of Department. (Spring)

***236 Experimental Techniques in Materials Science (3)**

Sample preparation. Optical microscopy including polarized light methods, phase contrast, interferometry. X-ray microscopy including Laue technique and Debye-Scherrer method. Electron probe microanalysis. Electron microscopy including electron optics, image formation and contrast for scanning and transmission electron microscopy. Field ion microscopy. Prerequisite: approval of Department. (As arranged)

237 Environmental Effects on Materials I (3)

Aqueous corrosion, electrochemistry, electrochemical reactions, polarization, environmental factors, integranular corrosion, stress corrosion, high-temperature corrosion, kinetics and mechanisms of corrosion, oxidation, liquid metal corrosion, irradiation effects. Prerequisite: approval of Department. (Fall, even years)

238 Environmental Effects on Materials II (3)

Corrosion problems in systems such as coal and oil-fired energy plants, fission and fusion reactors, gas turbines. Prerequisite: EngS 237. (Spring, odd years)

***239 Physical Ceramics (3)**

Crystal chemistry and the systematic study of the structure of ceramic materials; solid reactions occurring at elevated temperatures; sintering, vitrification, diffusional mechanisms and effects; reaction rate theory;

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

elastic, anelastic, and plastic properties of ionic and covalent solids; viscoelastic behavior of vitreous and vitreous-solid systems; phase equilibria of ceramic systems. Prerequisite: approval of Department. (Spring)

240 **Fracture Mechanics** (3)

Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture toughness, engineering analysis, notch strength analysis with limit approach, crack propagation laws, fatigue, fracture testing, comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261. (Spring)

241 **Fatigue and Failure of Materials** (3)

Extreme environments: oxidation, corrosion, high temperature creep; fatigue: cyclic hardening and softening, crack initiation and propagation, statistical analysis of strength. Prerequisite: approval of Department. (Fall)

242 **Materials Recycling and Recovery** (3)

Techniques and technologies for recovering and re-using waste materials and developing low-resource waste systems. Direct relationships of recycling and waste reduction to energy conservation. Effect of recycling on energy and environmental impacts of alternative materials and products; legal, economic, institutional, and environmental policy aspects of recycling and waste reduction. Prerequisite: approval of Department. (As arranged)

[a]249 **Special Topics in Materials Science** (3)

Prerequisite: approval of Department. (As arranged)

251–52 **Transportation Workshop** (3–3)

Students and staff from various disciplines are brought together for study of a selected transportation topic, or for study of the land-use objectives and transportation needs of a selected urban area and a survey of pertinent information and applicable solutions. Prerequisite: approval of Department. (Academic year)

253 **Control of Automated Transit Systems** (3)

(Formerly Control of Automated Transit Networks)

Automatic control techniques applied to automate various aspects of ground transportation system operation; discussion of application to rail, rapid rail, and small vehicle automated guideway transit systems; extension of road traffic characterizations to exclusive guideway transit systems; operating policies for automatically controlled vehicles; implementation of vehicle speed and separation control systems for various headways; design considerations for propulsion and braking systems; failsafe design principles; design case studies and examples of current technologies; impact of station and switch location on minimum headway; merging traffic control; vehicle routing and dispatching strategies for automated transit networks. Prerequisite: approval of Department. (Spring)

256 **Introduction to the Theories of Inelastic Media** (3)

Physical basis of anelasticity, viscoelasticity, plasticity, and viscoplasticity; constitutive equations of elastic and viscoelastic media; foundations of the theories of plasticity and viscoplasticity; boundary-value problems and wave propagation in inelastic media. Prerequisite: ApSc 213 or equivalent and approval of Department. (Spring)

[a] Offered at NASA-Langley Research Center; may be offered on campus when arranged.

259 Random Vibration of Structures (3)

Introduction to random processes; responses of linear structures to stationary and nonstationary random inputs; structural responses to earthquakes, storm waves, boundary layer turbulences, wind loads, random temperature, etc.; failure analysis of structures under random loads; first passage failure, fatigue, stress-corrosion and crack propagation under random stress histories. Prerequisite: CE 252 or ME 215 or approval of Department. (Fall)

260 Random Process Theory in Engineering (3)

Spectral analysis, linear system, the superposition principle; statistical prediction and probability function, Rayleigh distribution and its properties, threshold crossing problems, prediction of extreme values; statistical prediction of random vibration, application to civil and mechanical engineering. Prerequisite: ApSc 115 or equivalent. (Fall)

***263 Atmospheric Physics for Engineers I (3)**

Atmospheric radiation: phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of Department. (As arranged)

***264 Atmospheric Physics for Engineers II (3)**

Atmospheric dynamics: mean structure of the atmosphere, temperature, pressure, and wind fields; mass, momentum, and energy transfer; large-scale features of atmospheric circulation; regional features of atmospheric circulation; micrometerology. Prerequisite: approval of Department. (As arranged)

270 Theoretical Acoustics I (3)

(Formerly Introduction to Acoustics)

Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ME 221 and ApSc 213 or equivalent. (As arranged)

***271 Random Process Theory I (3)**

Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of Department. (As arranged)

***272 Random Process Theory II (3)**

Discrete and continuous state Markov-processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in communication theory; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 271. (As arranged)

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* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

*273 **Time Series Analysis** (3)

Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; periodogram, Blackman-Tukey and direct filtering methods of spectral estimation; effects of finite length and digitization; variability; coherence. Fast Fourier transform techniques; applications in modern technology. Prerequisite: EngS 271 or approval of Department. (As arranged)

274 **Noise and Vibration Control** (3)

Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise; automobile and truck noise; factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215. (As arranged)

*275 **Theoretical Acoustics II** (3)

(Formerly Advanced Theoretical Acoustics)

General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270. (As arranged)

*276 **Acoustical and Mechanical Measurements** (3)

Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215. (As arranged)

*277 **Physical Acoustics** (3)

Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275. (As arranged)

*278 **Psychological and Physiological Acoustics** (3)

Auditory system and its response to sound, experimental methodology in psychoaccustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of Department. (As arranged)

*279 **Human Factors in Engineering** (3)

Man-machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress. (Spring)

*280 **Special Topics in Acoustics** (3)

Current methods and problems in acoustics. Topics chosen from such

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of Department. (As arranged)

*281 **Advanced Programming Techniques for Engineering Mechanics Problems** (3)

Techniques for efficient construction of large computer programs for engineering systems with emphasis on fundamental structured programming principles. Application to engineering mechanics systems such as finite elements and structural optimization. Effects of CPU organization and other hardware features of computer systems at NASA-Langley on numerical computations involved in engineering systems. Organization and management of data bases for large engineering mechanics systems. Prerequisite: approval of Department. (Spring)

282 **Computer-aided Design** (3)

Fundamental concepts in the development of computational algorithms for the design of structures, machine component and assemblies, and other engineering systems. Representation of the design process and design specifications as a network of decision tables and logical flags. Optimization techniques and algorithms in design applications. Interactive computer-aided design methods based on the use of remote access computer terminals. General purpose computer programs for engineering analysis and design. Students, individually or in groups, are required to develop a small-scale general-purpose design program in an appropriate area such as structural design, machine design, urban planning, environmental quality control, etc. Prerequisite: EE 51 or equivalent, and CE 210 or equivalent, and approval of Department. (Fall)

283 **Application of Computer Graphics in Engineering** (3)

Curve-fitting techniques as applied to computer graphics; construction of a library of geometric lines and curves connecting a series of discrete points. Representation of two- and three-dimensional geometrical shapes by a set of discrete points. Automatic generation and display on CRT screen of geometrical shapes consisting of a grid of discrete points interconnected by user-selected geometric shapes. Automatic mesh generation, transformations, projections, and the concept of "hidden" lines. Use of remote computer terminals and graphic plotter equipment in interactive computer-graphics applications. Prerequisite: EE 51 or equivalent, and EngS 284 or equivalent. (Spring)

284 **Numerical Methods in Engineering** (3)

Uses of computers in engineering and science; numerical interpolation, integration and differentiation; least squares approximations and application to data fitting; roots of polynomials; eigenvalue and eigenvector problems; solution of systems of linear equations; ordinary differential equations; introduction to solution of partial differential equations; applications to initial and two-point boundary value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of Department. (Fall)

285 **Finite Element Methods in Engineering Mechanics** (3)

Formulation of the finite element method through variational principles for structural and continuum mechanics problems. Plane stress, plane

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

strain, three-dimensional elasticity, plate bending, thermal conduction, and potential flow. Techniques of constructing and assembling characteristic elemental matrices, computer implementation of the finite element method. Prerequisite: approval of Department. (Spring)

*286 **Analysis and Design of Thin-walled Structures** (3)

Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures; strength and stiffness of locally buckled stiffened structures; classification of loads and safety factors; different considerations governing the design of thin-walled structures; critical evaluation of various structural design procedures. Prerequisite: approval of Department. (As arranged)

*287 **Automated Design of Complex Structures** (3)

Review of techniques for automated design including mathematical programming, fully stressed design, and optimality criteria; application of automated design techniques to stiffened and composite shell-type structures; multiple-load conditions and design constraints. Prerequisite: approval of Department. (As arranged)

288 **Advanced Finite Element Methods in Structural Mechanics** (3)

Formulation of various finite element models in solid mechanics. Examination of errors, convergence characteristics. Application to nonlinear and dynamic problems including large deflection, stability, and inelastic problems. Recent developments of finite element methods. Prerequisite: EngS 285. (As arranged)

289 **Special Topics in Theoretical and Applied Mechanics** (3)

Prerequisite: approval of Department. (As arranged)

298 **Research** (arr.)

Basic research projects as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)

(Fall and spring)

*310 **Aeroacoustics** (3)

General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275. (As arranged)

*311 **Nonlinear Acoustics** (3)

Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of Department. (As arranged)

*312 **Theory of Random Vibration** (3)

Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215. (As arranged)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

*313 **Structural Acoustic Interaction** (3)

Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312. (As arranged)

314 **Advanced Numerical Methods in Engineering** (3)

Advanced methods for numerical solution to engineering problems; finite difference solutions to elliptic, parabolic, and hyperbolic equations, method of characteristics, implicit and explicit initial value methods and their stability, optimization and mathematical programming methods, numerical solutions to integral equations, selected topics for fourth-generation computers. Prerequisite: EngS 284, ApSc 213. (Spring)

315 **Introduction to Nonlinear Mechanics of Continua** (3)

Polar decomposition, invariance, isotropy, representation theorems for invariants and isotropic tensor functions; deformation, kinematics, stress, balance principles; principles for constitutive relations; applications to nonlinear elasticity and non-Newtonian fluids. Prerequisite: ApSc 212. (Spring)

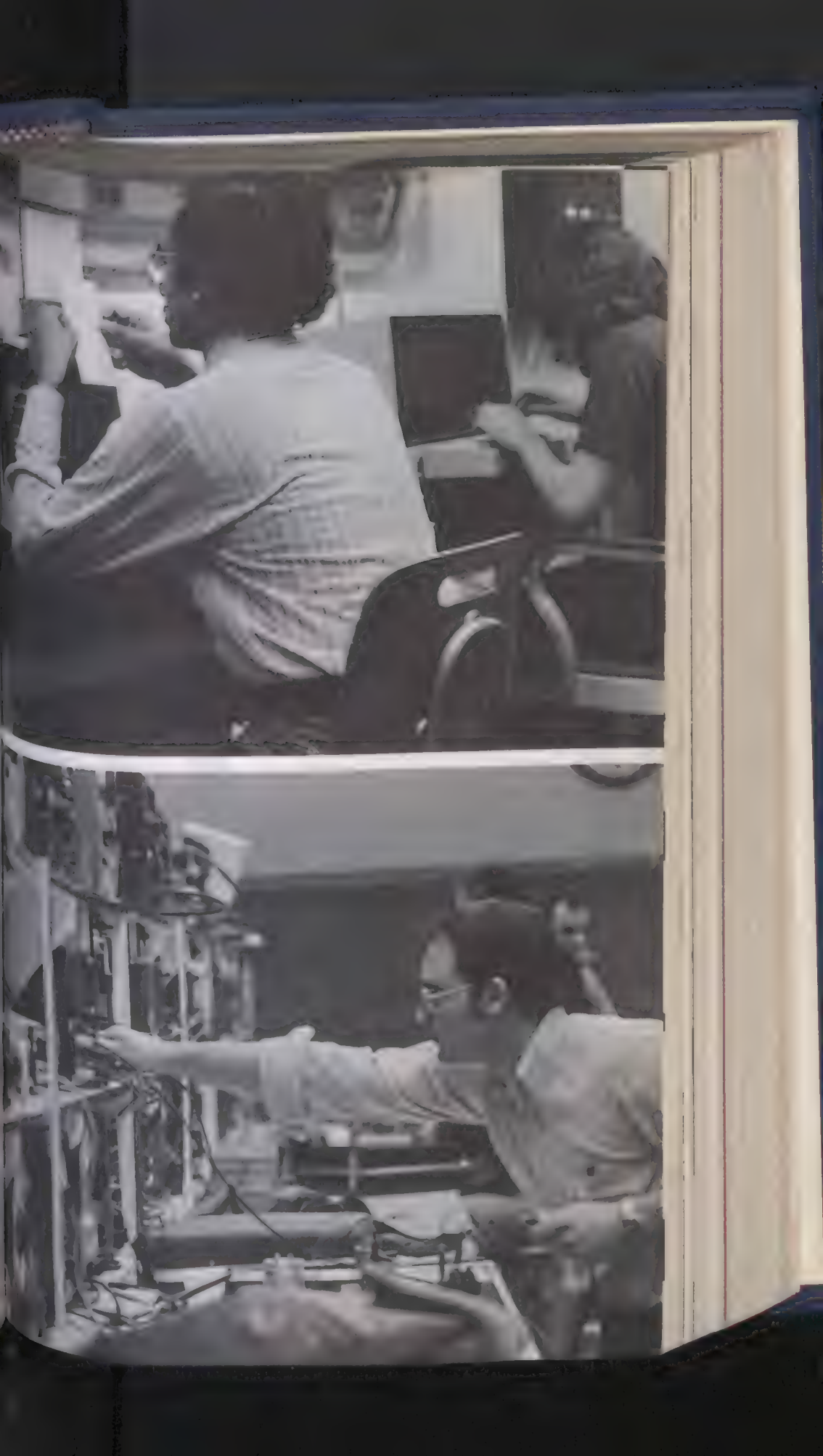
398 **Advanced Reading and Research** (arr.)

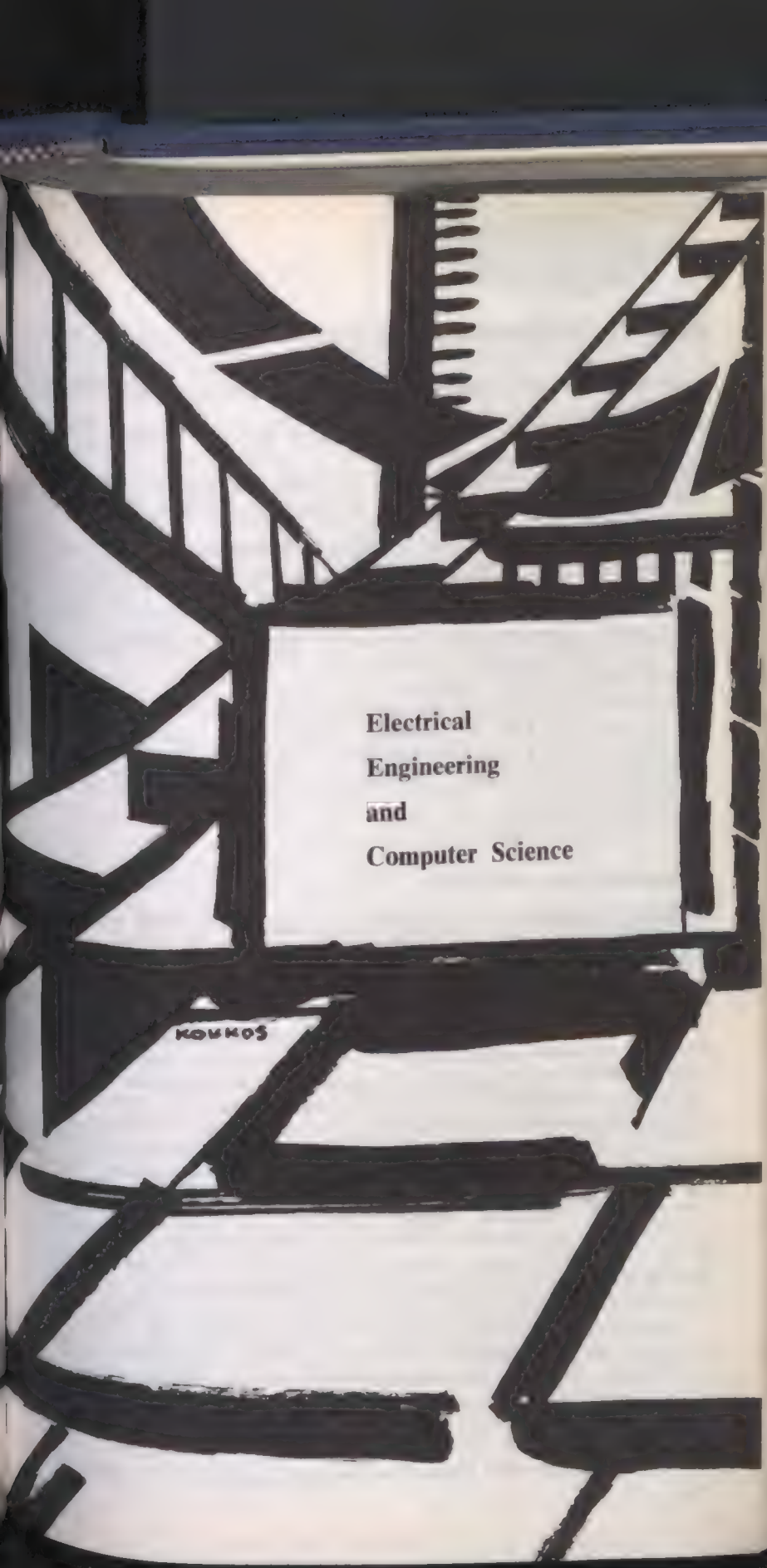
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.




Electrical
Engineering
and
Computer Science
KOUKOS

Electrical Engineering and Computer Science

Professors R.B. Heller, W.K. Kahn, R. Pickholtz, A.C. Meltzer *(Chairman)*, M. Eisenberg, W.D. Maurer, A.D. Friedman
Adjunct Professors F.K. Harris, C. Feldman, E. Weber, J. Pasta
Visiting Research Professor E. Lipsey
Professorial Lecturers W.F. Croswell, S.J. Raff, J.F. Halldane, G. Hintze
Associate Professors E.H. Braun, N. Kyriakopoulos, R.H. Lang, A. Abd-alla, H.J. Helgert, T.N. Lee, L.J. Hoffman, J.D. Foley
Associate Professorial Lecturers C.L. Fricke, W. Wasylkiwskyj, B.M. Horowitz, L. Schuchman, A.R. Shulman, W.H. Carter, A. Das, R.H. Thompson, P.J. Martin, J.W. Schwartz, R.L. Stermer, Jr., D.S. Arnstein, L. Hopewell, Jr., J.W. Benoit, C.S. Maiorana, R.E. Merwin, R.D. Shults, L.A. Rubin, A. Schneider, J.G. Adler, W.T. Bisignani, G. Frenkel, J.A. Knight, M.H. Loew, T. Nieh, D.C. Rohlfs, N.A. Sloan
Assistant Professor M.B. Feldman
Assistant Professorial Lecturers J.L. Wolfgang, Jr., W.J. English, R. Khatri, R.E. Schneider, J.W. Woods, W.A. MacDonald, J.J. Bisaga, F.D. Moore, E.S. Armstrong, J.E. Hogge, J.M. Russell III, C.T. Swift, J.H. Tucker, C.E. Dunham, R.C. Reynolds, P.D. Bergstrom, J.C.L. Lane, D.H. Pugh II, H.E. Lee, J.N. Shoosmith
Special Lecturer P. Bock

UNDERGRADUATE STUDY

Electrical engineering as an engineering discipline is concerned with mastering a knowledge of electricity. Electrical engineers design generators, which provide electrical energy for homes and factories, and transmission networks and the motors which utilize this power to drive machinery. By developing electromagnetic radiation, electrical engineers produce radio waves for the propagation of radio and television signals and the transmission of information via satellites. Electrical engineers design and develop electronic circuits used in communications equipment and computers. These machines have enhanced our thinking and computational capabilities to permit mankind to solve some of its most complicated problems. Microminiaturization of electronic components has permitted the development of handheld calculators and portable communication equipment. Electrical engineers are developing new instrumentation to assist the medical profession in understanding the causes of disease and to aid in preserving and prolonging life. The production of electricity from nuclear power and control of nuclear power plants is of growing concern to electrical engineers. The world's primary energy sources are limited, and electrical power has become an even more important resource. Electrical engineers are involved in the research to produce electrical energy directly from solar power.

Engineering is a broad profession. Its responsibilities and activities extend into every aspect of industry and research and into many fields of commerce and the arts. Electrical engineers face problems in the production and distribution of manufactured products, including the design of electrical equipment and of plants in which such products are made; in the design and construction of electronic equipment for control, guidance, and communication; in the operation of transportation systems; in pollution control; in the generation and

transmission of power; in the modern phases of communication; in the control of traffic; in medical engineering; and in the extensive and sophisticated use of digital and analog computers in data processing and the design and control of systems.

Electrical engineering is a branch of engineering in which practical as well as theoretical and scientific aspects are integrated into a well-balanced discipline. Basic sciences such as physics and mathematics form the roots on which electrical engineering builds to create an applied science and to develop problem-solving techniques. Analysis, synthesis, and design go hand in hand. The electrical engineering curriculum provides the student with such an integrated approach. The first two years of the curriculum are common to all undergraduate fields in the School and develop a sound foundation of basic sciences coupled with engineering sciences. The third year continues with engineering sciences and begins an in-depth study of electrical engineering. The fourth year is devoted totally to electrical engineering. At the fourth year the student has a choice of either following the regular electrical engineering curriculum or branching off into an area of concentration in computer science or in pre-medical engineering.

The Department of Electrical Engineering and Computer Science has recently acquired modern laboratory equipment, including its own computer. The student has an opportunity during the last year to work on individual projects where ingenuity, coupled with faculty advice and guidance, allows concentration in areas such as computers, communications, microwaves, controls, electronics, medical engineering, and circuits.

Course schedules have been arranged to accommodate the full-time, the part-time, and the co-op student. Undergraduate courses are offered once a year during the day for full-time students, and once every two years in the evening for part-time students.

Subject Areas

COMMUNICATIONS

EE 143: Elements of Communication Engineering Design I
EE 144: Elements of Communication Engineering Design II

COMPUTER SCIENCE

CSci 51: Applications of Computers
CSci 52: Computers and Societal Problems
CSci 152: Introduction to Digital Computers
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Systems Programming
CSci 157: Machine and Assembly Language Programming
CSci 158: Algorithmic Methods and High-level Languages
CSci 159: Programming and Data Structures
CSci 161–62: Computer Science Laboratory

CONTROLS AND SYSTEMS

EE 172: Control Systems Design

EE 177: Electrical Energy Conversion
EE 178: Electrical Power Systems

ELECTRONICS

EE 20: Introductory Engineering Electronics
EE 121: Engineering Electronics and Design
EE 122: Pulse and Waveshaping Electronic Design
EE 124: Electronic Devices

FIELDS AND WAVES

EE 31: Fields and Waves I
EE 32: Fields and Waves II
EE 133: Electromagnetic Waves and Microwave Systems Design

LABORATORIES AND MEASUREMENT

EE 60: Introductory Electrical Engineering Laboratory I
EE 61: Introductory Electrical Engineering Laboratory II
EE 160: Electrical Measurements and Instrumentation
EE 161–62: Electrical Engineering Laboratory
EE 165: Senior Design Project

MEDICAL ENGINEERING

EE 184: Medical Engineering Instrumentation and Systems Design

NETWORKS

EE 11: Linear Networks I
EE 12: Linear Networks II
EE 113: Network Analysis and Design
EE 116: Introduction to Network Synthesis

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

EE 51: Applications of Computers (3)
Math 30: Precalculus (3)
Math 31: Calculus of One Variable (3)
Phys 3: Foundations of Physics (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

EE 52: Computers and Societal Problems (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Math 32: Calculus of Several Variables (3)
Phys 14: Introductory Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3)

Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Chem 13: General Chemistry (4)
Phys 15: Elements of Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Phys 16: Introduction to Modern Physics (3)
Elective: Selected from humanities or social sciences (3)

Electrical Engineering Curriculum

Fifth Semester

EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 60: Introductory Electrical Engineering Laboratory I (2)
EE 157: Machine and Assembly Language Programming (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

EE 32: Fields and Waves II (3)
EE 61: Introductory Electrical Engineering Laboratory II (2)
EE 121: Engineering Electronics and Design (3)
EE 152: Introduction to Digital Computers (3)
EE 177: Electrical Energy Conversion (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

EE 122: Pulse and Waveshaping Electronic Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 161: Electrical Engineering Laboratory (2)
Elective: Technical electives (9) (three courses selected from EE 113, 133, 153, 155, 178; ME 131, 187)

Eighth Semester

EE 144: Elements of Communication Engineering Design II (3)
EE 162: Electrical Engineering Laboratory (2)
EE 172: Control Systems Design (3)
Elective: Technical electives (5) (two courses selected from EE 116, 124, 160, 165, 184; ME 194)

Technical Electives

EE 113: Network Analysis and Design (3)

EE 116:	Introduction to Network Synthesis (3)
EE 124:	Electronic Devices (3)
EE 133:	Electromagnetic Waves and Microwave Systems Design (3)
EE 153:	Design of Switching Systems (3)
EE 155:	Introduction to Numerical Methods for Computers (3)
EE 160:	Electrical Measurements and Instrumentation (3)
EE 165:	Senior Design Project (2)
EE 178:	Electrical Power Systems (2)
EE 184:	Medical Engineering Instrumentation and Systems Design (3)
ME 131:	Thermodynamics (3)
ME 187:	Heat Transfer Theory (3)
ME 194:	Energy Conversion (3)

Computer Science Option

Computer science is a developing discipline which combines electronic design, programming of computers, and mathematics into one comprehensive area. The student learns the design and utilization of computers for scientific and business applications. Students who complete this option will be able to design both hardware and software needed for minicomputer and large-scale computing systems. The student will also be competent in hardware and software utilization of computers for control of large systems. The curriculum prepares the student for a career in computer design, applications, and utilization, or to continue study in graduate school.

Prerequisite: first four semesters as described in the Core Curriculum, see pages 112–113.

Fifth Semester

CSci 157:	Machine and Assembly Language Programming (3)
EE 12:	Linear Networks II (3)
EE 20:	Introductory Engineering Electronics (3)
EE 31:	Fields and Waves I (3)
EE 60:	Introductory Electrical Engineering Laboratory I (2)
Elective:	Selected from humanities or social sciences (3)

Sixth Semester

CSci 152:	Introduction to Digital Computers (3)
CSci 159:	Programming and Data Structures (3)
EE 32:	Fields and Waves II (3)
EE 61:	Introductory Electrical Engineering Laboratory II (2)
EE 121:	Engineering Electronics and Design (3)
Elective:	Selected from humanities or social sciences (3)

Seventh Semester

CSci 153:	Design of Switching Systems (3)
CSci 155:	Introduction to Numerical Methods for Computers (3)
CSci 158:	Algorithmic Methods and High-level Languages (3)
CSci 161:	Computer Science Laboratory (2)
EE 122:	Pulse and Waveshaping Electronic Design (3)
Elective:	Technical elective (3) (one course selected from EE 113, 133, 143)

Eighth Semester

CSci 154: Digital Computer Design (3)
CSci 156: Introduction to Systems Programming (3)
CSci 162: Computer Science Laboratory (2)
EE 172: Control Systems Design (3)
Elective: Technical elective (3) (one course selected from EE 124, 144, 184)

Technical Electives

EE 113: Network Analysis and Design (3)
EE 124: Electronic Devices (3)
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 144: Elements of Communication Engineering Design II (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)

Premedical Engineering Option

The Premedical Engineering option will permit the student who completes the work to obtain a bachelor's degree in engineering and have sufficient preparation to apply to a medical school for work toward a doctor of medicine degree. The student will also have sufficient background to work in various allied health fields, in the research and development of new electronic equipment used in medicine, or to continue as a graduate student in engineering with exceptional qualifications for medical engineering.

Prerequisite: first four semesters as described in the Core Curriculum, see pages 112–113.

Fifth Semester

BiSc 11: Introductory Biology for Science Majors (4)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 60: Introductory Electrical Engineering Laboratory I (2)
EE 157: Machine and Assembly Language Programming (3)

Sixth Semester

BiSc 12: Introductory Biology for Science Majors (4)
Chem 22: Introductory Quantitative Analysis (4)
EE 32: Fields and Waves II (3)
EE 61: Introductory Electrical Engineering Laboratory II (2)
EE 121: Engineering Electronics and Design (3)
EE 152: Introduction to Digital Computers (3)

Seventh Semester

Chem 151: Organic Chemistry (3)
Chem 153: Organic Chemistry Laboratory (1)
EE 122: Pulse and Waveshaping Electronic Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 161: Electrical Engineering Laboratory (2)

Elective:	Selected from humanities or social sciences (3)
Elective:	Technical elective (3)

Eighth Semester

Chem 152:	Organic Chemistry (3)
Chem 154:	Organic Chemistry Laboratory (1)
EE 144:	Elements of Communication Engineering Design II (3)
EE 162:	Electrical Engineering Laboratory (2)
EE 172:	Control Systems Design (3)
Elective:	Selected from humanities or social sciences (3)
Elective:	Technical elective (3)

Technical Electives

Bioc 221–22:	General Biochemistry (3 or 4—4 or 5)
BiSc 145:	Introduction to Vertebrate Embryology (4)
BiSc 148:	Histology (4)

Electrical Engineering Undergraduate Courses

11 Linear Networks I (3)

Signals and waveforms, average value and RMS, network concepts, elements, and parameters. Kirchhoff's laws, simple networks, energy and power, differential equations of networks and their solution, phasors and steady-state analysis, measurements, impedance concepts, resonance, and filtering. Prerequisite: Phys 15; prerequisite or concurrent registration ApSc 114. (Spring—day and evening; fall—evening)

12 Linear Networks II (3)

Singular functions; Laplace transform; network functions, poles and zeros; total response; time and frequency domains; convolution theorems; Fourier analysis, spectra; frequency response, Bode plots; two-port parameters. Prerequisite: ApSc 114, EE 11. (Every fall—day and evening; spring—evening)

20 Introductory Engineering Electronics (3)

Various types of devices used in electronic engineering considered from the point of view of the physics of their operation and from the engineering point of view of their application to electronic circuits. Solid-state, vacuum, and gaseous devices. Primary emphasis on application of these elements in power supplies and in linear amplifiers. Introduction of design concepts through use of graphical techniques. Prerequisite: EE 11. (Fall—day and evening; spring—evening)

31 Fields and Waves I (3)

Vector calculus, orthogonal coordinates, Coulomb's and Gauss' laws, scalar potential, dipoles, method of images, Laplace's and Poisson's equations, boundary-value problems. Prerequisite: Phys 15, 16; ApSc 114. (Every fall—day; fall, even years—evening)

32 Fields and Waves II (3)

Biot-Savart law, Ampere's law, vector potential, magnets, polarization and polarization currents, Faraday's law, Maxwell's equations, plane waves, and Poynting vector. Prerequisite: EE 31. (Every spring—day; spring, odd years—evening)

51 **Applications of Computers** (3) (Same as CSci 51)

Introduction to the solution of problems on a digital computer using the FORTRAN and BASIC languages; data processing concepts and numerical methods using batch and interactive time-shared terminal computer systems; writing, debugging, and running programs on various digital computer systems. **(Academic year—day and evening)**

52 **Computers and Societal Problems** (3) (Same as CSci 52)

Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Software methods for simulation, graphic display, data reduction, and file generation and access in time-shared and batch environments using FORTRAN and BASIC. Computer-related societal problems and processes. Group projects emphasizing research and investigative techniques applied to student-selected interests. Prerequisite: CSci or EE 51 or equivalent; two years of college preparatory mathematics. **(Spring—day; spring, even years—evening)**

60 **Introductory Electrical Engineering Laboratory I** (2)

Use, theory of design, and application of standard electronic laboratory equipment; applications of instrumentation through experiments in basic network theorems; measurement of electrical quantities and characteristics of electrical devices. Prerequisite or concurrent registration: EE 12, 20, 31. **(Fall—day and evening; spring—evening)**

61 **Introductory Electrical Engineering Laboratory II** (2)

Characteristics of electronic devices and circuits; design of electronic amplifiers and measurement of their properties; experiments in support of courses in networks, fields, and electronics. Prerequisite or concurrent registration: EE 12, 32, 60, 121. **(Spring—day and evening; fall—evening)**

113 **Network Analysis and Design** (3)

Applications of matrix theory and linear graphs to electrical network analysis; network equations; signal-flow graphs; introduction to state-space techniques; solution of state-space equations on a digital computer. Network transfer functions, properties of active networks including reciprocity, stability, activity, and feedback. Use of network analysis programs such as ECAP. Prerequisite: EE 12, 20. **(Every fall—day; fall, even years—evening)**

116 **Introduction to Network Synthesis** (3)

Network functions and their properties. Positive-real functions and testing for this property. Two-element, one-port network synthesis; RLC one-port synthesis; the approximation problem in the frequency domain; modern filter theory and design; two-port ladder and lattice synthesis. Introduction to digital filters; truncation errors; realization techniques. Prerequisite: EE 113. **(Every spring—day; spring, odd years—evening)**

121 **Engineering Electronics and Design** (3)

Graphical analysis and design beyond the level covered in EE 20. Introduction of incremental analysis and design methods to electronic circuits; use of equivalent circuits; amplifiers, oscillators, modulation and demodulation. Prerequisite: EE 12, 20. **(Every spring—day; academic year—evening)**

122 **Pulse and Waveshaping Electronic Design** (3)

Introduction to and design of nonlinear circuits used in modern-day computer and communications systems. Pulse, sweep, switching, and logic circuits; counting and timing circuits. Prerequisite: EE 121. (Every fall—day; fall, even years—evening)

124 **Electronic Devices** (3)

Principles of operation of electronic devices used in electrical networks, communication systems, and electronic circuits. Properties of electronic devices and their applications. Modeling of devices such as diodes, transistors, and lasers. Fabrication methods of discrete components and integrated circuits. Prerequisite: EE 12, 32, 121; Phys 16. (Every spring—day; spring, odd years—evening)

133 **Electromagnetic Waves and Microwave Systems Design** (3)
(Formerly Electromagnetic Waves)

Time-harmonic Maxwell equations, complex Poynting vector, transmission lines, characteristics of common waveguides, resonant cavities, Smith chart, design of coaxial and waveguide systems, Lorentz reciprocity, simple antennas, design of linear antenna arrays. Prerequisite: EE 32. (Every fall—day; fall, even years—evening)

143 **Elements of Communication Engineering Design I** (3)
(Formerly Elements of Communication Engineering I)

Fourier series and transforms; power spectra and correlation; principles of modulation; amplitude, angle, and pulse modulation; modulation and demodulation systems; time and frequency division multiplexing. Comparison of communication systems optimized for their design in a noisy channel. Prerequisite or concurrent registration: EE 12, 121. (Every fall—day; fall, odd years—evening)

144 **Elements of Communication Engineering Design II** (3)
(Formerly Elements of Communication Engineering II)

Introduction to the statistical theory of communication, random signals and noise, concepts of information theory, transmission of information over noisy channels, comparison of modulation systems in the presence of noise. Prerequisite: ApSc 115, EE 143. (Every spring—day; spring, even years—evening)

152 **Introduction to Digital Computers** (3) (Same as CSci 152)

Design of digital computers using integrated circuits. Combinational logic and digital logic circuits. Boolean algebra, number systems, codes, and arithmetic operations in digital computers. Use of LSI in digital design. Microprocessors and interfacing with I/O equipment. Minicomputer design and programming. Analog computers, analog-to-digital conversion, and analog components. Prerequisite: CSci 157 or permission of instructor. (Spring—day and evening)

153 **Design of Switching Systems** (3) (Same as CSci 153)

Switching algebra and Boolean logic; sets, relations, and lattices. Analysis and design of switching devices; design of combinational logic networks. Minimization techniques and decomposition methods. Electronic implementation of logic; contact networks, symmetric functions, and threshold logic. Reliable design and fault-detection tests. Number systems and codes, geometric interpretation, error detecting and correcting codes; encoders and decoders. Logic and electronic design of functional digital units. Sequen-

tial circuits and iterative networks. Minimization and transformation of sequential machines; structure of sequential machines; partitions and covers. State identification and fault-detection experiments. Prerequisite: CSci or EE 152 or permission of instructor. (Fall—day and evening)

154 **Digital Computer Design** (3) (Same as CSci 154)

Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams in timing and control signals. Design of binary and decimal, serial and parallel digital arithmetic units. Design of memory subsystems, channels, I/O, and storage subsystems. Design of the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci or EE 153 or permission of instructor. May be taken for graduate credit. (Spring—day and evening)

155 **Introduction to Numerical Methods for Computers** (3) (Same as CSci 155)

Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; CSci or EE 51; or equivalent. (Every fall—day; fall, even years—evening)

156 **Introduction to Systems Programming** (3) (Same as CSci 156)

Computer software systems; concepts in the use of macro-assemblers, loaders, monitors, dispatchers, initiators, and control programs. Control of input-output in a multiprogrammed environment. Control of the task, job stream, and secondary storage. Job control languages. Prerequisite: CSci 158 and CSci 159. (Spring—day; spring, even years—evening)

157 **Machine and Assembly Language Programming** (3)(Same as CSci 157)

Architecture of various digital computers. Number systems and codes. Programming of minicomputers and multiprogrammed large computers in machine and assembly language. Techniques in structured programming. Methods of addressing and machine control for fixed and variable word-length computers. Programming on a stack architecture computer. Input-output control on a minicomputer. Prerequisite: CSci or EE 51 or equivalent. (Fall—day and evening; spring—evening)

158 **Algorithmic Methods and High-level Languages** (3)(Same as CSci 158)

High-level programming languages. Comparison of computer languages and their structure. Structured programming with high-level languages. Introduction to compiler structure and parsing of statements. Syntax of high-level languages and their recognizers. Backus-Normal form, correctness of programs, reentrant programming and reentrant compilers. Prerequisite: CSci 157 or permission of instructor. May be taken for graduate credit. (Fall—day and evening; spring—evening)

159 **Programming and Data Structures** (3) (Same as CSci 159)

Use of macro-assembler, subroutine linkages and I/O in an assembler, access methods and storage management, buffer pools and memory management, discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings and linked structures.

Sorting, searching, hashing, and merging of data files. List and string processing languages. Prerequisite: CSci or EE 157; or equivalent. (Spring—day and evening)

160 **Electrical Measurements and Instrumentation** (3)

Electrical measurement from direct current through high radio frequencies. Measurements of current, voltage, power, resistance, capacitance, inductance, energy, phase angle, frequency, and time. Measurements of high frequency signals including field strength, signal-to-noise ratio, impedance and attenuation. Analog-to-digital conversion techniques and digital instrumentation for the control of measurement and instrumentation systems. Transducer characteristics and analog signal processing instrumentation. Laboratory demonstrations of measurements and instrumentation techniques. Prerequisite: EE 12, 32, 121, 152. (Spring—evening)

161–62 **Electrical Engineering Laboratory** (2–2)

Experiments in support of courses in networks, electronics, microwaves, computers, communications, controls, and machines. The student is required to begin a design project in EE 161 and complete it in EE 162. Prerequisite or concurrent registration: EE 61, 113, 122; CSci or EE 152; EE 161 is prerequisite to EE 162. (Academic year—day and evening)

165 **Senior Design Project** (2)

The student will conceive, design, construct, and test an original project in hardware or software. He will write a complete report including schematic diagrams and repair procedures, if applicable. This project cannot be used to satisfy the project required in EE 161–62 *Electrical Engineering Laboratory*. Prerequisite: senior status. (Spring—day)

172 **Control Systems Design** (3)

(Formerly Control Systems)

Mathematical models of linear systems; steady-state and transient analyses; root locus and frequency response methods; synthesis of linear feedback control systems. Prerequisite: ApSc 114; and EE 12 or ME 134. (Spring—day and evening)

177 **Electrical Energy Conversion** (3)

Fundamentals of electromechanical energy conversion. Electromechanical transducers and their equivalent circuits, three-phase and single-phase a-c rotating machines, d-c machines, rotating machines as circuit elements. Prerequisite: EE 12, 31. (Every spring—day; spring, even years—evening)

178 **Electrical Power Systems** (2)

Introduction to electrical power systems; transmission and distribution of electrical power, three-phase circuits, symmetrical components, fault analysis by digital computer. Load-flow studies, economic considerations. Power station designs and synchronization of generators. Methods of generating electrical power. Prerequisite: EE 177, senior status. (Fall—evening)

184 **Medical Engineering Instrumentation and Systems Design** (3)

(Formerly Introduction to Medical Engineering)

Designed to introduce the engineering or physical sciences student to the applications of engineering design in the medical sciences; terminology of the medical profession emphasized; the physiology of the human body

presented from overall systems or functional approach; survey of present-day medical measurements and consideration of those areas in which engineering design may be applied advantageously to medicine. May be taken for graduate credit. Admission by permission of instructor. (Spring—evening)

198 Research (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

Computer Science Undergraduate Courses

51 Applications of Computers (3)

Introduction to the solution of problems on a digital computer using FORTRAN and BASIC languages; data processing concepts and numerical methods using batch and interactive time-shared terminal computer systems; writing, debugging, and running programs on various digital computer systems. (Academic year—day and evening)

52 Computers and Societal Problems (3)

Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Software methods for simulation, graphic display, data reduction, and file generation and access in time-shared and batch environments using FORTAN and BASIC. Computer-related societal problems and processes. Group projects emphasizing research and investigative techniques applied to student-selected interests. Prerequisite: CSci or EE 51 or equivalent; two years of college preparatory mathematics. (Spring—day; spring, even years—evening)

152 Introduction to Digital Computers (3)

Design of digital computers using integrated circuits. Combinational logic and digital logic circuits. Boolean algebra, number systems, codes, and arithmetic operations in digital computers. Use of LSI in digital design. Micro processors and interfacing with I/O equipment. Minicomputer design and programming. Analog computers, analog-to-digital conversion, and analog components. Prerequisite: CSci 157 or permission of instructor. (Spring—day and evening)

153 Design of Switching Systems (3)

Switching algebra and Boolean logic; sets, relations, and lattices. Analysis and design of switching devices; design of combinational logic networks. Minimization techniques and decomposition methods. Electronic implementation of logic; contact networks, symmetric functions, and threshold logic. Reliable design and fault-detection tests. Number systems and codes, geometric interpretation, error detecting and correcting codes; encoders and decoders. Logic and electronic design of functional digital units. Sequential circuits and iterative networks. Minimization and transformation of sequential machines; structure of sequential machines; partitions and covers. State identification and fault-detection experiments. Prerequisite: CSci 152 or permission of instructor. (Fall—day and evening)

154 Digital Computer Design (3)

Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams in timing and control signals. Design of binary and decimal, serial and par-

allel digital arithmetic units. Design of memory subsystems, channels, I/O, and storage subsystems. Design of the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci 153 or permission of instructor. May be taken for graduate credit. (Spring—day and evening)

155 **Introduction to Numerical Methods for Computers** (3)

Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; CSci or EE 51; or equivalent. (Every fall—day; fall, even years—evening)

156 **Introduction to Systems Programming** (3)

Computer software systems; concepts in the use of macro-assemblers, loaders, monitors, dispatchers, initiators, and control programs. Control of input-output in a multiprogrammed environment. Control of the task, job, job stream, and secondary storage. Job control languages. Prerequisite: CSci 158, 159. (Spring—day; spring, even years—evening)

157 **Machine and Assembly Language Programming** (3)

Architecture of various digital computers. Number systems and codes. Programming of minicomputers and multiprogrammed large computers in machine and assembly language. Techniques in structured programming. Methods of addressing and machine control for fixed and variable wordlength computers. Programming on a stack architecture computer. Input-output control on a minicomputer. Prerequisite: CSci or EE 51 or equivalent. (Fall—day and evening; spring—evening)

158 **Algorithmic Methods and High-level Languages** (3)

High-level programming languages. Comparison of computer languages and their structure. Structured programming with high-level languages. Introduction to compiler structure and parsing of statements. Syntax of high-level languages and their recognizers. Backus-Normal form, correctness of programs, reentrant programming and reentrant compilers. Prerequisite: CSci 157 or permission of instructor. May be taken for graduate credit. (Fall—day and evening; spring—evening)

159 **Programming and Data Structures** (3)

Use of a macro assembler, subroutine linkages and I/O in an assembler, access methods and storage management, buffer pools and memory management, discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings and linked structures. Sorting, searching, hashing, and merging of data files. List and string processing languages. Prerequisite: CSci or EE 157 or equivalent. (Spring—day and evening)

161–62 **Computer Science Laboratory** (2–2)

Experiments in support of digital logic, electronics, systems and software. Use of integrated circuits and microprocessors to develop digital systems. Interfacing I/O equipment to computers. Analog computing, hybrid computing, and A-to-D converters. The student begins a design project in

CSci 161 and completes it in CSci 162. CSci 161 is prerequisite to CSci 162. Prerequisite or concurrent registration: EE 61, 122; CSci 153, 157, 158. **(Academic year—day and evening)**

GRADUATE STUDY

The Department of Electrical Engineering and Computer Science provides the student who possesses a degree of maturity and basic knowledge one of the most stimulating experiences for advanced study. The Department offers study leading to the Master of Science, Professional, and Doctor of Science degrees. The student may study in an area of concentration such as Systems Science, Networks, and Controls; Electrophysics (electronics, fields and waves); Communications; Medical Engineering; Computer Science (hardware, software, and systems); Computer Heuristics, Modeling, and Numerical Methods; and Energy Conversion, Power, and Transmission.

The graduate programs are formulated to take into consideration the student's individual strengths, skills, aspirations, and abilities and are determined through consultation by the student with the faculty adviser. The program should provide the student with a thorough understanding of the area of concentration and with a breadth of knowledge necessary in modern engineering and computer science. Each graduate student is assigned a faculty adviser on the basis of study interests, helping to develop a close student-faculty relationship during the course of the program.

The graduate programs are also designed to provide an educational service to the Washington technical community. Many courses have been developed after consultation with private industry and government agencies in the area. They are offered both during the afternoon and evening and rotate from year to year.

The Department of Electrical Engineering and Computer Science has continuously kept the graduate program up to date through contact with recent developments, research generated within the Department, and the addition of experts in appropriate fields who serve as part-time and adjunct faculty.

The Department of Electrical Engineering and Computer Science publishes a detailed brochure to supplement the present catalogue with information about procedures, requirements, regulations, and scope of its graduate programs. Special pamphlets describing specific programs are also available.

Areas of Concentration

COMMUNICATIONS

EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 241: Information Theory
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II
EE 245: Signal Detection and Estimation Theory
EE 246: Digital Communications
EE 247: Communication Systems
EE 249: Data Telecommunication Networks

EE 252: Digital Signal Processing Techniques
EE 253: Sonar Systems
EE 254: Radar Systems
EE 257: Issues in Computer Communications
EE 258: Radio Communication Systems I
EE 259: Radio Communications Systems II
EE 277: Space Communication Systems
EE 298: Research
EE 299–300: Thesis Research
EE 345: Advanced Detection Theory
EE 346: Communications Switching and Traffic Theory
EE 349: Communications Research
EE 399: Dissertation Research

COMPUTER HEURISTICS, MODELING, AND NUMERICAL METHODS

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CSci 158: Algorithmic Methods and High-Level Languages
CSci 201: Introduction to Computer Systems I
CSci 202: Introduction to Computer Systems II
CSci 213: Discrete Structures in Computing
CSci 214: Data Structures
CSci 219: Interactive Computer Graphics
CSci 220: Pattern Recognition
CSci 223: Simulation and Heuristics
CSci 232: Automata Theory
CSci 278: Analog and Hybrid Computers
CSci 281: Applications of Numerical Methods I
CSci 282: Applications of Numerical Methods II
CSci 285: Approximation of Functions and Data Representations
CSci 286: Numerical Methods in Engineering I
CSci 287: Numerical Methods in Engineering II
CSci 288: Numerical Methods in Engineering III
CSci 289: Numerical Methods in Engineering IV

COMPUTER SCIENCE (HARDWARE, SOFTWARE, AND SYSTEMS)

CSci 201: Introduction to Computer Systems I
CSci 202: Introduction to Computer Systems II
CSci 208: Computer Programming
CSci 213: Discrete Structures in Computing
CSci 214: Data Structures
CSci 216: Information Retrieval Systems
CSci 219: Interactive Computer Graphics
CSci 220: Pattern Recognition
CSci 223: Simulation and Heuristics
CSci 227: Management Information Systems and Data Base Management
CSci 232: Automata Theory
CSci 237: Computing Systems
CSci 239: Comparative Computer Systems
CSci 240: Theory and Practice of Microprogramming
CSci 245: Advanced Computer Systems Theory I
CSci 246: Advanced Computer Systems Theory II

CSci 255: Formal Languages, Correctness, and Structured Programming
CSci 256: Design of Translators
CSci 263: Digital Computer Programming Systems
CSci 267: Operating Systems I
CSci 268: Operating Systems II
CSci 278: Analog and Hybrid Computers
CSci 298: Research
CSci 299–300: Thesis Research
CSci 391: Computer Science Research
CSci 399: Dissertation Research

ELECTROPHYSICS (ELECTRONICS, FIELDS, AND WAVES)

EE 201: Natural Modes and Transients in Electrical Systems
EE 206: Electromagnetic Theory and Applications I
EE 207: Electromagnetic Theory and Applications II
EE 221: Physical Electronics I
EE 222: Physical Electronics II
EE 223: Optical Communications Systems
EE 224: Electronics of Lasers
EE 225: Nonlinear Electronics
EE 226: Fiber and Integrated Optics
EE 227: Industrial Electronics
EE 228: High-frequency Electronics
EE 231: Field Analysis and Potential Theory
EE 232: Electrodynamics
EE 233: Microwaves and Components
EE 234: Electromagnetic Wave Propagation
EE 235: Antennas
EE 236: Plasma Dynamics
EE 237: Waves in Random Media
EE 255: Optical Processing
EE 298: Research
EE 299–300: Thesis Research
EE 323: Principles of Microelectronics
EE 329: Electrophysics Research
EE 399: Dissertation Research

ENERGY CONVERSION, POWER, AND TRANSMISSION

EE 201: Natural Modes and Transients in Electrical Systems
EE 202: Linear System Theory I
EE 212: Advanced Network Analysis
EE 261: Electromechanical Energy Conversion
EE 264: Direct Electrical Energy Conversion
EE 265: Electrical Power Production
EE 266: Electrical Power Transmission and Distribution
EE 267: Power Networks
EE 269: Issues in Electrical Power Systems

MEDICAL ENGINEERING

EE 256: Environmental Optics
EE 281: Medical Instrumentation I
EE 282: Medical Instrumentation II
EE 283: Introduction to Medicine for Engineers I: Physiology and Anatomy

EE 284: Introduction to Medicine for Engineers II: Clinical Medicine
EE 285: Engineering in Physical Medicine and Rehabilitation
EE 286: Sensory-evoked Potentials I
EE 287: Computer-aided Analysis of Physiological Signals
EE 288: Physiological Controls and Systems
EE 289: Clinical Engineering
EE 298: Research
EE 299–300: Thesis Research
EE 381: Bioelectric Phenomena
EE 386: Sensory-evoked Potentials II
EE 389: Medical Engineering Research
EE 399: Dissertation Research

SYSTEMS SCIENCE, NETWORKS, AND CONTROLS

EE 201: Natural Modes and Transients in Electrical Systems
EE 202: Linear System Theory I
EE 203: Linear System Theory II
EE 212: Advanced Network Analysis
EE 213: Computer-aided Analysis and Design of Networks
EE 215: Linear Network Synthesis I
EE 216: Linear Network Synthesis II
EE 272: Discrete Systems
EE 273: System Optimization
EE 274: Nonlinear Systems
EE 275: System Identification and Adaptive Systems
EE 276: Cybernetics
EE 278: Spacecraft Systems Design
EE 298: Research
EE 299–300: Thesis Research
EE 319: Systems Science, Networks, and Controls Research
EE 371: Simulation Methods for System Analysis
EE 372: Analysis and Control of Large Systems
EE 399: Dissertation Research

THE MASTER OF SCIENCE DEGREE PROGRAM

The Department of Electrical Engineering and Computer Science offers graduate study leading to the degree of Master of Science in the following areas of concentration. Faculty members who may serve as advisers are listed after each area.

1. Communications (Braun, Helgert, Heller, Lang, Pickholtz)
2. Computer Heuristics, Modeling, and Numerical Methods (Abd-Alla, Bock, Feldman, Maurer, Meltzer)
3. Computer Science (hardware, software, and systems) (Abd-Alla, Bock, Feldman, Kyriakopoulos, Maurer, Meltzer)
4. Electrophysics (electronics, fields, and waves) (Braun, Eisenberg, Heller, Kahn, Lang)
5. Energy Conversion, Power, and Transmission (Meltzer, Kahn, Lang)
6. Medical Engineering (Eisenberg)
7. Systems Science, Networks, and Controls (Kyriakopoulos, Lee, Meltzer)

There are no required courses or programs of study in any of the areas of concentration. Each student formulates an individualized program in consultation with the assigned faculty adviser.

Admission

In addition to the general requirements, the applicant must have satisfied admission to graduate study (see page 25), applicants for Master of Science programs in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science.
2. The applicant must have at least a quality-point index of 2.50 (on a scale with 4.00 maximum), or equivalent, for the last 60 semester hours of undergraduate work.
3. The applicant must be adequately prepared in the basic sciences (chemistry, physics, and/or biology) and in mathematics (calculus through differential equations).

SPECIFIC REQUIREMENTS

In addition to the general requirements, the applicant must have satisfied through undergraduate studies the following specific requirements according to the area in which he or she plans to concentrate:

Communications

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Communication theory (3 semester hours—EE 143; or equivalent)

Computer Heuristics, Modeling, and Numerical Methods

1. Computer programming using FORTRAN (3 semester hours—CSci 51; or equivalent)
2. Mathematics including partial differential equations, matrices, and eigenvalue problems)
3. Probability and statistics (3 semester hours—ApSc 115; or equivalent)

Computer Science

1. Computer programming using FORTRAN (3 semester hours—EE 51; or equivalent)
2. Computer hardware and computer software (6 semester hours—CSci 152 and CSci 157; or equivalent)

Electrophysics

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)
2. Electronics including analysis, design, and physical theory (6 semester hours—EE 20 and 121; or equivalent)
3. Fields and waves (6 semester hours—EE 31 and 32; or equivalent)

Energy, Conversion, Power, and Transmission

1. Network analysis using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)

2. Fields and waves (6 semester hours—EE 31 and 32; or equivalent)
3. Electrical energy conversion (3 semester hours—EE 177; or equivalent)

Medical Engineering

1. Network theory (3 semester hours—EE 11; or equivalent)
2. Electronic circuits (6 semester hours—EE 20 and 121; or equivalent)
3. Computer programming (3 semester hours—CSci 51; or equivalent)

Systems Science, Networks, and Controls

1. Networks with applications using Laplace transforms (9 semester hours—EE 11, 12, and 113; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Control theory (3 semester hours—EE 172; or equivalent)

In cases where some undergraduate deficiencies exist, the student may be required to complete 6 semester hours of undergraduate work. Normally this work must be completed prior to enrolling in graduate courses. If such deficiencies represent more than 6 semester hours, the applicant may be admitted as an unclassified student to complete a specified undergraduate program before being admitted as a graduate student.

Program of Study

Upon admission to the Master of Science degree program, the graduate student is assigned a faculty adviser. In consultation, the student and faculty adviser formulate the program of study and complete the form "Graduate Program of Studies" (Form 1) for submission to the Department Chairman for approval. This form should be completed prior to or at the student's first registration. During consultation, the student should determine whether to request permission to pursue the nonthesis option.

The program of study for the Master of Science degree will consist of a minimum of 24 semester credit hours of graduate-level courses and 6 semester hours of thesis; or, for the nonthesis option, a minimum of 33 credit hours of graduate-level courses. For the thesis option, a minimum of 12 credit hours must be in the major field of concentration, and no less than three graduate courses must be in areas other than the student's area of concentration (major). For the nonthesis option, a minimum of 21 credit hours must be in the major field, and no less than three courses must be in areas other than the student's major area.

A maximum of two courses at the 100 level may be counted toward the requirements for the degree; the course description must specify that the course may be taken for graduate credit.

Master's Comprehensive Examination

After completing the prescribed program in either the thesis or the nonthesis option, the student must pass the Master's Comprehensive Examination. The examination is scheduled twice a year (see Calendar). On the prescribed form the student must notify the Department by the date shown on the Calendar of the student's intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused ab-

ence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts an entire day, and the student is asked to solve several problems relating to the subject matter of his major area of study. The student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is not limited to those specific courses which the student has taken, but is designed to demonstrate the student's ability to integrate material from several course areas as well as to learn from the readings.

A student who fails the Master's Comprehensive Examination on his first attempt may be re-examined one more time if approval is given by the appropriate examining committee. In the event of failure to pass the examination on the second attempt, the student's candidacy and graduate status terminate.

THE PROFESSIONAL DEGREE PROGRAM

The Department of Electrical Engineering and Computer Science offers graduate study leading to a Professional degree. This program provides for those students who are interested in pursuing course work beyond the Master's degree with emphasis on applied subject material rather than on research. Successful completion of the Professional degree program leads to the degrees of Engineer or Applied Scientist. Students may study for the Professional degree in the following areas of concentration: Communications; Computer Science (hardware, software, and systems); Electrophysics (electronics, fields, and waves); Medical Engineering; Systems Science, Networks, and Controls; Energy Conversion, Power, and Transmission; and Computer Heuristics, Modeling, and Numerical Methods.

There are no formal required courses or programs of study in any of the areas of concentration for the Professional degree. Each student formulates an individualized program in consultation with the assigned faculty adviser.

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward a Professional degree (see pages 29–30), applicants for the Professional degree programs in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science.
2. The applicant must have at least a quality-point index of 3.2 (on a scale of 4.00 maximum), or equivalent, in graduate course work leading to the master's degree; or a minimum of 3.0 and two years of professional experience after obtaining the master's degree.
3. The applicant must be adequately prepared in the basic sciences (chemistry, physics and/or biology) and in mathematics (calculus through differential equations).

SPECIFIC REQUIREMENTS

In addition to the general requirements, the applicant must also satis through previous studies the following specific requirements according to area of concentration:

Communications

Nine semester hours of statistical theory of communication and 3 semest hours of information theory—EE 204, 241, 243, and 244; or equivalent.

Computer Heuristics, Modeling, and Numerical Methods

Twelve semester hours of numerical methods at the graduate level—CSci 2 223, 281, and 282; or equivalent.

Computer Science

Twelve semester hours of computer system design and software beyond th use of a compiler language—CSci 201, 202, 213, and 214; or equivalent.

Electrophysics

Twelve semester hours of physical electronics and electromagnetics at th graduate level—EE 201, 206, 207, and 221; or equivalent.

Energy Conversion, Power, and Transmission

Nine semester hours of electrical machine theory and networks at the grad uate level—EE 202, 261, and 266; or equivalent.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 28 282, 283, and 284; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours of network system analysis at the graduate level, in cluding a knowledge of state space and linear graph theory—EE 201, 202, 20 and 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study which is increased beyond the minimum requirements so that sufficient back ground material may be covered.

Program of Study

Upon admission to the Professional degree program, the student is assigned a faculty adviser. Together they will formulate a program of study for the stu dent which must contain a minimum of 30 semester hours of courses, and complete the form "Graduate Program of Study." Programs of study and all subsequent changes must be approved by both the faculty adviser and the Department chairman.

The program of study for the Professional degree in the Department of Electrical Engineering and Computer Science will normally consist of a mini mum of 18 semester hours of graduate-level courses in the major area of con centration and a minimum of 9 additional semester hours of graduate-level courses outside the major area but in support of the student's program. A student who is changing the major area from that studied for the Master's

degree or who is lacking the specific requirements needed for admission may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

THE DOCTOR OF SCIENCE PROGRAM

The Department of Electrical Engineering and Computer Science offers programs of graduate study leading to the degree of Doctor of Science in the areas of concentration listed below. There are no formal required courses or programs of study in the areas listed. Upon admission, each student formulates an individualized program in consultation with the assigned faculty adviser. Faculty members who may serve as advisers are listed after each area.

1. Communications (Braun, Helgert, Heller, Lang, Pickholtz)
2. Computer Heuristics, Modeling, and Numerical Methods (Bock, Hoffman, Maurer, Meltzer)
3. Computer Science (Abd-Alla, Bock, Feldman, Foley, Friedman, Hoffman, Maurer, Meltzer)
4. Electrophysics (Braun, Eisenberg, Heller, Kahn, Lang)
5. Medical Engineering (Eisenberg)
6. Systems Science, Networks, and Controls (Kyriakopoulos, Lee, Meltzer)

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward the Doctor of Science degree (see page 92), applicants for the Doctor of Science degree in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science.
2. The applicant must have a minimum quality-point index of 3.20 (on a scale of 4.00 maximum), or equivalent, in graduate course work leading to the Master's degree.
3. The applicant must be adequately prepared in the basic sciences (chemistry, physics, and biology) and in mathematics (calculus through differential equations).

SPECIFIC REQUIREMENTS

In addition to the above general requirements, the applicant must also satisfy through previous studies the following specific requirements according to the area of concentration (major area):

Communications

Nine semester hours of statistical theory of communication and 3 semester hours of information theory—EE 204, 241, 243, and 244; or equivalent.

Computer Heuristics, Modeling, and Numerical Methods

Twelve semester hours of numerical methods at the graduate level—CS 201, 223, 281, and 282; or equivalent.

Computer Science

Twelve semester hours of computer system design and software beyond the use of a compiler language—CSci 201, 202, 213, and 214; or equivalent.

Electrophysics

Twelve semester hours of electronics and electromagnetic fields and waves at the graduate level—EE 201, 206, 207, and 221; or equivalent.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—BE 281, 282, 283, and 284; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours in network system analysis at the graduate level, including a knowledge of state space and linear graph theory—EE 201, 202, 20[illegible] and 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study which is increased beyond the minimum requirements so that sufficient background material may be covered for doctoral studies.

Program of Study

At the time of admission, the graduate student in pursuit of a Doctor of Science degree in the Department of Electrical Engineering and Computer Science is assigned a faculty adviser in the major area of study. In consultation with the adviser, the student will determine the two minor areas of study and the foreign language important in the student's field of study. Together they will formulate a program of study for the student leading to the Qualifying Examination and complete the form "Graduate Program of Study" (Form 1). Programs of study and any subsequent changes must be approved by both the faculty adviser and Department chairman.

MAJOR AREA

The program of studies for the Doctor of Science degree will normally consist of one major area of concentration and two minor areas totaling a minimum of 30 semester hours of graduate-level courses (200 and above) beyond the Master's degree level. A minimum of 15 semester hours must be taken in the major area. A student who is changing the major area from that studied for the Master's degree or who is missing specific admission requirements may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

MINOR AREAS

The student in consultation with the faculty adviser formulates a program of study which includes two minor areas as part of the total doctoral studies. For

those students who take their minor area studies within the Department of Electrical Engineering and Computer Science, the following courses specify adequate programs in each minor area:

Communications
EE 204; 205 or 241; 243; and 244 or 249

Computer Heuristics, Modeling, and Numerical Methods
CSci 223, 281, 282, and 285

Computer Science
CSci 201, 202, 213, and 214 or 237 or 263

Electrophysics
EE 201, 206, 207, and 221

Energy Conversion, Power, and Transmission
EE 202, 261, 264, and 265

Medical Engineering
EE 281, 282, 283, and 284

Systems Science, Networks, and Controls
EE 202, 203, 212, and 273

Minor areas are not confined to the Department of Electrical Engineering and Computer Science, but may be taken from other departments within the University such as Mathematics, Statistics, Operations Research, and Physics. Normally a minimum of three graduate-level courses constitutes a minor area.

QUALIFYING EXAMINATION

The Qualifying Examination for doctoral students in the Department is composed of two parts. All incoming doctoral students must pass the first examination within five semesters of their entrance. This first examination is the Department's Master's Comprehensive Examination (MCE) in the major area. The student must demonstrate superior performance to qualify formally as a student in the Department at the doctoral level. Students with an M.S. degree from this Department who continue with the same major area into doctoral work and who have demonstrated superior performance on the MCE have the requirement for this first examination waived. A student may take the MCE only two times. Failure to show superior performance on the MCE in the major field will result in termination of the student's candidacy.

Upon completion of the student's formal program of study and after demonstrating superior performance on the MCE and passing the foreign language examination, the student is prepared to complete the Qualifying Examination. The purpose of this second part of the Qualifying Examination is to ascertain that the student's depth and breadth of background and intellectual development are adequate to support doctoral research and investigation in the major area.

This second portion of the Qualifying Examination is comprised of a written part covering the major area (one day) and each minor area (one day each). In addition and subsequent to the written examination, there may be an

oral examination. The student must pass the entire second part of the Qualifying Examination. A candidate who fails any portion of the Examination on the first attempt may take those portions of the Examination one more time if approval is given by the appropriate examining committee. Failure to pass the Qualifying Examination will terminate the student's candidacy in the doctoral program.

The questions on the Qualifying Examination are not limited to those specific areas in which the student has taken course work, but are designed to demonstrate the student's ability to integrate the material from several course areas as well as from individual study and readings. Hence, the student should be familiar with the contemporary work of the current journals and the contents of the books on the particular reading lists in the areas of examination as well as those used in the course work.

Electrical Engineering Graduate Courses

201 Natural Modes and Transients in Electrical Systems (3)

Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; sampling. Prerequisite: graduate status. (Fall and spring—evening)

202 Linear System Theory I (3)

Graph theory and its application to networks and systems; system description in time and frequency domain; linear spaces and linear operators; mathematical representation of linear systems; analytical and computer solutions of the state equations; transient and steady-state response. Prerequisite: graduate status. (Fall—evening)

203 Linear System Theory II (3)

System properties; controlability and observability of linear systems; sensitivity and stability analyses. Irreducible realizations of rational transfer-function matrices; canonical forms, state feedback, and state estimators. Linear composite systems. Prerequisite: EE 202. (Spring—evening)

204 Stochastic Signals and Noise (3)

Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. (Fall and spring—evening)

205 Stochastic Processes in Electrical Engineering (3)

Markov chains, state classification, Kolmogorov equation; applications to probabilistic finite-state machines. Birth-death process, applications to queuing theory, buffer problems, and the design of communication nets. Continuous state processes, diffusion processes, passage times, and estimation problems. Estimation and power spectra. Stochastic difference and differential equations. Applications to communication theory, control theory, computer science, and propagation theory of random media. Prerequisite: EE 204 or equivalent. (Spring—evening)

206 Electromagnetic Theory and Applications I (3)

Brief review of vector-phasors and Maxwell's equations, electromagnetic

potentials, power and energy; plane waves, frustrated total reflection, skin effect, anisotropic media; solution of radiation problems in the Kirchoff approximation; elementary applications. Prerequisite: EE 133 or equivalent. (Fall—evening)

207 **Electromagnetic Theory and Applications II** (3)

Introduction to advanced techniques for problems in electromagnetics; leaky waves and complex wave-types, stationary phase and steepest descent approximations for integrals in the complex plane. Discrete and continuous spectra. Application to optical fibers, surface and leaky wave antennas, ground wave propagation. Prerequisite: EE 201 or equivalent, EE 206. (Spring—evening)

212 **Advanced Network Analysis** (3)

Network theorems, network functions, relationship of parts of network functions; network properties, realizability and causality concepts; computer-aided network analysis. Prerequisite: EE 201, 202; or equivalent. (Spring, odd years—evening)

213 **Computer-aided Analysis and Design of Networks** (3)

Description and use of network analysis programs such as ECAP, CORNAP, and NASAP. Algorithmic methods for time and frequency domain analysis of networks using a digital computer, numerical solution of state equations, fast Fourier transform, network design by optimizing searches on digital computers, synthesis of electrical networks using unconstrained optimization techniques in the time domain, network design through approximation such as Fourier series, Chebyscheff functions, and Padé approximation. Prerequisite: EE 51, 212. (Fall, odd years—evening)

215 **Linear Network Synthesis I** (3)

Properties and testing of positive real functions. Synthesis of LC, RL, RC one-port networks. Brune, Bott-Duffin, Miyata, Kuh, and Darlington synthesis techniques. Introduction to two-port ladder and lattice synthesis. Three-terminal RC network synthesis approximation in the frequency and time domains. Prerequisite: EE 202 or permission of instructor. (Fall, even years—evening)

216 **Linear Network Synthesis II** (3)

Advanced topics in passive one-port and two-port synthesis. Introduction to n-port synthesis. Active network synthesis using negative resistance, controlled sources, NIC, gyrator, operational amplifiers, and circulators. Synthesis of distributed integrated networks. Computer-aided network optimization. Prerequisite: EE 215. (Spring, odd years—evening)

221 **Physical Electronics I** (3)

Theoretical principles underlying the operation of electronic devices; classical mechanics and classical statistical mechanics, the quantum theory, wave and matrix mechanics, quantum statistics. Prerequisite: EE 207 or equivalent. (Fall—evening)

222 **Physical Electronics II** (3)

The Boltzmann transport equation, band theory of solids, time-dependent perturbation theory, group theory. Applications to semiconductor and other solid-state devices such as transistors, tunnel diodes, masers, and lasers. Prerequisite: EE 221. (Spring—evening)

223 Optical Communications Systems (3)

Optical communication channels; survey of laser sources; modulation, line-of-sight links; system models and analysis; detection, photoemitters, photodiodes, and photoconductors; noise mechanisms and signal-to-noise analysis; optical fiber waveguides, electromagnetic field description of material, waveguide, and modal dispersion; optic fiber cabling, repeaters, and systems analysis; integrated optic components. Prerequisite: EE 207, 243. (Spring—evening)

224 Electronics of Lasers (3)

Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms; rate equations. Resonators, He-Ne laser; organic dye lasers; injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 or equivalent. (Fall, even years—evening)

225 Nonlinear Electronics (3)

Analysis and design of electronic components and systems operating as switching, sweeping, gating, and pulse generators; study of multivibrators, negative resistance devices and amplifiers, nonlinear operation of oscillators. Prerequisite: EE 201 or equivalent. (Fall—evening)

226 Fiber and Integrated Optics (3)

Single-mode and multimode propagation in stepped-index and gradient-index optical fibers: scattering and attenuation characteristics of fibers, phase velocity, group velocity, impulse response, energy transport, ray tracing, Goos-Haenchen shift, Hamiltonian formalism; directional couplers, modulators, and deflectors in fibers and surface films; coupled-mode theory. Prerequisite: EE 223 or equivalent. (Spring, odd years—evening)

227 Industrial Electronics (3)

Applications of electronic devices in industry; continuous and sampled control systems; induction and dielectric heating; timing and counting circuits; reliability and automatic checking equipment; digital control of machine tools. Prerequisite: EE 201 or equivalent; and graduate status. (Spring, odd years—evening)

228 High-frequency Electronics (3)

Design and analysis of the operation of electron-tube, solid-state, crossed-field, space-charge wave, and quantum maser oscillators and amplifying devices that lay the foundation of modern communication systems. Prerequisite: EE 207 or equivalent. (Spring—evening)

231 Field Analysis and Potential Theory (3)

General study of the theory of potentials as used to facilitate solution of problems in electromagnetic theory, mechanics, thermodynamics, optics, and gravitation. Emphasis on mathematical methods such as Green's functions, variational methods, principal axis transformations, and multi-dimensional Fourier transforms. Prerequisite: EE 207. (Fall, even years—evening)

232 Electrodynamics (3)

Special theory of relativity and the Lorentz transformation: Minkowski formulation. Maxwell's equations in the context of special relativity, electromagnetic potentials, and stress tensors. Lagrangian and Hamiltonian formulations, radiation from moving charges. Introduction to quantum electrodynamics. Prerequisite: EE 207. (Spring, even years—evening)

233 Microwaves and Components (3)

High-frequency transmission lines and guided systems; matching techniques; scatter ferrite isolators, gyrators; Faraday rotation; microwave networks; directional couplers; cavity resonators and microwave components. Prerequisite: EE 207. (Fall—evening)

234 Electromagnetic Wave Propagation (3)

Retarded time scalar, vector, and Hertz potential. Dipole and dipole array fields; Mie theory of electromagnetic scattering by spheres. Propagation in electrically and magnetically anisotropic media such as dielectric crystals, space-charge plasmas, and ferrites. Wave propagation in inhomogeneous media; Liouville transformation, Lagrange's variation of parameters, WKB solution, invariant imbedding techniques. Propagation in stochastic and dispersive media. Prerequisite: EE 207. (Fall, odd years—evening)

235 Antennas (3)

General solution of Maxwell's equations in terms of current sources, the far field approximations, radiation from current distributions, field equivalence theorems, the geometrical optics approximation, aperture antennas, receiving antennas, the theory of arrays, and applications to specific antennas and antenna types. Prerequisite: EE 207. (Spring—evening)

236 Plasma Dynamics (3)

Study of the interaction of fluids with electromagnetic fields. Generalized Navier-Stokes and energy equations, magnetogasdynamic and magnetohydrodynamic approximations, boundary-layer theory, statistical theory of turbulence, generalized Von Karman-Howarth equation, Boltzmann transport equation. MHD generators and devices. Prerequisite: EE 207. (Spring, even years—evening)

237 Waves in Random Media (3)

Propagation and scattering of electromagnetic, optical, and acoustic waves in random media, scattering from rough surfaces and randomly distributed particles, turbulence. Applications to propagation through rain and fog. Laser beam scintillations, remote sensing, and communication channel modeling. Computer simulation by Monte Carlo techniques. Prerequisite: EE 204, 207. (Fall, odd years—evening)

241 Information Theory (3)

Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem; bounds on the performance of communication system; the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204. (Fall—evening)

242 Coding Theory (3)

Error-correcting codes; bounds on the performances of error-correcting codes, group codes; syndrome decoding; cyclic codes, their encoding and decoding; Galois fields; BCH codes, burst correction, and threshold-decodeable codes; performance calculations. Prerequisite: EE 204. (Spring—evening)

243 Communication Theory I (3)

Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and

noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent. (Fall—evening)

244 **Communication Theory II** (3)

Schemes for efficient signaling for data sequences; effects of quantizing at the receiver; detection of such signals in colored noise; detection of stochastic signals; the innovations approach in detection and estimation problems; signaling over fading channels and the optimum receivers; diversity techniques and their performances. Prerequisite: EE 243. (Spring—day and evening)

245 **Signal Detection and Estimation Theory** (3)

Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244; or equivalent. (Fall—evening)

246 **Digital Communications** (3)

Bounds on the performance of data communications; channels with high dispersion; intersymbol interference and its minimization; Nyquist criteria, eye openings, tail cancellation techniques, correlative coding, transversal equalizers, adaptive equalizers; broadband, noise limited channel; orthogonal codes, simplex codes, bounds on error probability; reception by matched filters, "Green machine," and other techniques; convolutional codes; decoding by sequential decoding and Viterbi decoding; performance analysis. Prerequisite: EE 241, 244; or equivalent. (Spring—evening)

247 **Communication Systems** (3)

Wiener filters, phase-locked loops and their optimization. Parameter estimation theory with application to optimum demodulation of analog wave forms (DSB-AM, SSB-AM, FM). Comparative analysis of analog modulation systems. Digital communication systems—coherent and noncoherent reception of binary and M-ary signals and their performance analysis. Frequency acquisition and synchronization. Prerequisite: EE 241, 244. (Fall—evening)

249 **Data Telecommunication Networks** (3)

Techniques for the analysis and design of data networks with store, feedforward, and message switching capability, queuing theory, Erlang's formula, priority systems; optimization based on minimization of message delay; synchronous and asynchronous multiplexing; topological problems, graph theory, connectivity and survivable networks, probabilistic graphs; data networks with a central computer; terminal oriented systems. Prerequisite: EE 205 or equivalent. (Fall—evening)

*250 **Telecommunication Systems Concepts** (3)

Essential elements of an electrical communication system, speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency, and pulse code modulation and comparative performance. Multiplexing schemes, communication quality standards, and objectives. Signal power, noise power, distortion, and channel capacity. Probability, traffic theory

* EE 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

reliability, voice, TV, and data transmission. Telecommunication, microwave radio, cable, and satellite communications systems. (As arranged)

*251 **Survey of Telecommunication Systems** (3)

Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major design considerations. Overall system design of microwave radio system. Radiowave propagation fundamentals. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design consideration and values of significant parameters for a typical satellite communications link. Overall design of a cable communication system. Digital transmission and terminals. Wideband data transmission. Frequency allocation. (As arranged)

252 **Digital Signal Processing Techniques** (3)

Digital signal processing and data reduction techniques; applications to communications, controls, image enhancement, radar, and speech processing. Least-squares fitting of polynomials; sampling and quantization. Recursive and nonrecursive digital filter design. Generation and shaping of pseudo-random noise. Estimation of correlation functions and spectral densities. Digital processing for Kalman-Bucy filters. Extraction of signals and timing from noise. Fast Fourier and Hadamard transforms. Software and hardware implementation of signal processing algorithms. Prerequisite: EE 51 or equivalent; EE 204; and graduate status. (Fall—evening)

253 **Sonar Systems** (3)

Underwater sound propagation; transducer and transducer arrays; detection, localization, and tracking techniques; array processing; time compression correlation and digital processing of signals; effects of nonhomogeneous noise fields; applications to navigation and communications in the ocean environment. Prerequisite: EE 244. (Fall—evening)

254 **Radar Systems** (3)

The radar equation, range and resolution limits; MTI radars; detection and estimation techniques; clutter characteristics and detection in clutter; signal design; ambiguity functions; Doppler radar; phased arrays; synthetic aperture techniques; digital and optical processing and computer control. Applications. Prerequisite: EE 206, 244. (Spring—evening)

255 **Optical Processing** (3)

Fourier transforms by diffraction of light, optical spectrum analysis, optical memories and systems, holography and holographic techniques, properties and techniques for photographic reproduction. Prerequisite: EE 201. (Fall—evening)

256 **Environmental Optics** (3)

Distribution of radiation: power converting and transferring systems; UV, luminous, IR spectral sources; daylight; moonlight; luminaries. Environmental boundaries—transmission, reflection, diffusion, refraction, diffraction, dispersion, bleaching, phototropy, polarization. Simulation of organismic responses: response definition—physiological, overt behavioral, perceptual, cognitive. Stimulus-response correlation model; correlating measurement concepts. (Spring—evening)

*EE 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

257 **Issues in Computer Communications** (3)

Fundamentals of data communications, systems, integrating computers and telecommunications, modems, multiplexers, concentrators and lines. Networks of computers: distributed and centralized. Network organization: circuit-switched, store-and-forward, and packet-switched. System design considerations; management factors; economic and regulatory issues; changes in technology; effect on systems cost performance; regulation, value-added networks. (Spring—evening)

258 **Radio Communication Systems I** (3)

Analysis and design of microwave communication systems for terrestrial, satellite, and over-the-horizon scatter radio channels. Propagation effects and channel characterization including refraction, reflection, multipath, scattering, and absorption. Effects of earth curvature and characteristics of over-land and over-water propagation. Antenna considerations including gain, directivity, polarization, and antenna patterns. Frequency and time-division multiplexing and modulation techniques. Effects of noise, interference, and fading. Diversity techniques. Prerequisite: EE 206, 244. (Fall—evening)

259 **Radio Communication Systems II** (3)

Morphology of the ionosphere, propagation of ionspherically reflected radiowaves, anomalous ionospheric propagation mechanisms, linear antenna structures, atmospheric noise, digital modulation techniques, non-Gaussian channel performance, diversity, fading channel error control, typical VLF, LF, and HF system design. Prerequisite: EE 258 or permission of instructor. (Spring—evening)

261 **Electromechanical Energy Conversion** (3)

Characteristics of synchronous machines, synchronous reactance, reactance theories, synchronizing generators and parallel operation of machines, characteristics of asynchronous machines, machines as circuit elements, steady-state and dynamic performance of alternating current machines. (Fall—evening)

264 **Direct Electrical Energy Conversion** (3)

Theory and practice for direct production of electricity using solar cells, thermionic converters, fuel cells, and batteries. Concepts of solid state, energy bands, work function and conversion efficiency, and limitations. (Spring—evening)

265 **Electrical Power Production** (3)

Production of electrical power from primary energy sources. Use of hydrocarbon fuels in the production of steam; hydroelectric generation and tidal variations as primary energy. Geothermal energy, nuclear fission, magnetohydrodynamics, fusion and solar concentrators as primary energy sources. (Fall, odd years—evening)

266 **Electrical Power Transmission and Distribution** (3)

Transmission line characteristics, exact and approximate equivalent circuits; line configurations; standing waves, filtering and protection, high voltage lines; equivalent circuits of transformers, line losses, substation design, d.c. transmission, distribution systems. (Spring, even years—evening)

267 **Power Networks** (3)

Symmetrical components, short and opened circuit analysis of power net-

works, stability of electrical grids, fault analysis, network reliability, frequency control, load flow analysis. Prerequisite: EE 266. (Fall, even years—evening)

269 **Issues in Electrical Power Systems** (3)

Load flow analysis of large power networks, economic considerations on network topology; optimal network layout; rate structures, cost of primary energy, plant locations, environmental considerations in network design and operation. (Spring, odd years—evening)

272 **Discrete Systems** (3)

Sampling processes and theorems; Z-transforms and modified Z-transforms; responses of discrete systems using transformation techniques and state equations; stability criteria; design of digital controller for discrete systems. Prerequisite: EE 203 or equivalent. (Spring, even years—evening)

273 **System Optimization** (3)

Parameter optimization problems; theory of minima and maxima. Optimization problems for dynamic systems; calculus of variations; the maximum principle and the Hamilton-Jacobi equation. Optimization problems with constraints; optimal feedback systems. Numerical solution of optimal problems. Prerequisite: EE 203 or equivalent. (Fall—evening)

274 **Nonlinear Systems** (3)

Definition of linear and nonlinear systems; introduction to approximate analysis of nonlinear systems—describing functions, Krylov and Bogoliubov's asymptotical method and Tsypkin's locus. Forced oscillations—jump resonance. Stability analysis—Liapunov's criterion, Luré's problem, and Popov's method. Prerequisite: EE 203. (Spring, odd years—evening)

275 **System Identification and Adaptive Systems** (3)

Introduction to the adaptive problem and practical applications. Determining the mathematical representation of systems—the identification problem. Optimal estimation of states in the presence of uncertainties. Adaptive systems. Prerequisite: EE 203, 204; or equivalent. (Fall, even years—evening)

276 **Cybernetics** (3)

Principles of machines or mechanisms made by men or nature with regard to their ways and forms of possible behaviors: regular, determinate, or reproducible; fundamental concepts of finite differences; changes and transformations as sets of transitions, leading to stability and feedback; statistical concepts of complex systems and blackbox theory; Shannon's information theory; regulation and control of mechanisms. Prerequisite: EE 204 or equivalent. (Fall, odd years—evening)

277 **Space Communication Systems** (3)

Theoretical and application aspects of space communications, as related to communication satellite systems, scientific satellites, manned space missions, and deep space missions. Prerequisite: EE 244. (Fall—evening)

278 **Spacecraft Systems Design** (3)

Space environment; structure, propulsion, control, and instrumentation of spacecraft—launch, orbit, transit, and re-entry problems; bioastronautic considerations. Prerequisite: graduate status. (Spring, even years—evening)

281 **Medical Instrumentation I** (3)

Theory of measurements in biological areas, techniques for electronic measurements on biological specimens, current problems in medical metrology stressing electronic systems. Prerequisite: EE 283 or permission of instructor. (Fall—evening)

282 **Medical Instrumentation II** (3)

Medical telemetry systems, medical use of the computer, engineering techniques in patient treatment, principles of good medical instrumentation. Prerequisite: EE 283 or permission of instructor. (Spring—evening)

283 **Introduction to Medicine for Engineers I: Physiology and Anatomy** (3)

Designed to acquaint the engineering student with the physiology of the human body; material based on the curriculum of the School of Medicine and taught from a systems viewpoint; concepts of cellular structure and function integrated into the tissue and organs, which are then related to the various systems of the body; interrelationships of the body systems, i.e., the interaction of the nervous system with the musculoskeletal system or the interaction of the respiratory system and its functions with the cardiovascular system. (Fall—evening)

284 **Introduction to Medicine for Engineers II: Clinical Medicine** (3)

Clinical aspects of medicine. Further elaboration of physiological systems, such as the endocrine system, renal physiology, gastrointestinal physiology, and others; the separate systems of the body are integrated to present the functioning of the body as an overall system; considerable interaction with physicians and other medical personnel. Prerequisite: EE 283. (Spring—day)

285 **Engineering in Physical Medicine and Rehabilitation** (3)

Application of engineering theory and techniques to the rehabilitation of handicapped persons; major problem areas and general approaches, as well as specific solutions. Offered cooperatively with personnel from the Social and Rehabilitation Services Administration. Prerequisite: EE 284. (Fall—evening)

286 **Sensory-evoked Potentials I** (3)

Physiological significance of the sensory-evoked potential, stimulation variables, subject variables, data acquisition procedures and instrumentation, signal-averaging computers, analysis techniques for the VEP, applications of the VEP. Lectures, discussion, and laboratory. Prerequisite: EE 281, 282, 283, 284; or permission of instructor. (Fall—evening)

287 **Computer-aided Analysis of Physiological Signals** (3)

Computer analysis of physiological data obtained from the cardiovascular, pulmonary, and nervous systems. Sources and detection of various signals obtained from these systems; algorithmic techniques applicable to the analysis of these signals; students, provided with real data obtained from hospital patients, are required to develop computer software for determining pertinent medical parameters as established by physicians. Prerequisite: EE 281, 282, 283, 284; and a working knowledge of FORTRAN. (Fall—evening)

288 **Physiological Controls and Systems** (3)

Some applications of control and systems theory in the medical and biological fields. Application of general control and systems theory as applied to physiological systems. Specific applications of control and systems

theory to the visual system, respiratory system, cardiovascular system, and musculoskeletal system. Prerequisite: EE 172 or equivalent; EE 281, 282, 283, 284. (Spring—evening)

289 **Clinical Engineering** (3)

A cross-sectional view of clinical engineering applications, functions, variations, and patterns in the medical and allied health care area. Use of instrumentation, computers, and systems by clinical engineers in hospitals and clinics. The clinical engineer in cardiovascular measurement systems and intensive care units; other areas where functional usage of clinical engineering is applicable. Prerequisite: EE 281, 282, 283. (Spring—evening)

298 **Research** (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)

(Fall and spring)

319 **Systems Science, Networks, and Controls Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

323 **Principles of Microelectronics** (3)

Basic principles, techniques, and processes necessary for understanding microelectronics. Semiconductor physics, phase diagrams, crystal growth, epitaxy, vacuum techniques, thin-film deposition, diffusion, oxidation, junction formation, masking, and properties of thin films and materials. Prerequisite: EE 222 or equivalent. (Fall, odd years—evening)

329 **Electrophysics Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

345 **Advanced Detection Theory** (3)

Review of general estimation equations. Linear estimation; Weiner and Kalman-Bucy filters; nonlinear modulation theory; angle-modulation systems, analysis and design of phase-lock loops, optimum angle-modulation, rate distortion theory; Gaussian processes in Gaussian noise, detection and parameter estimation, canonical receivers, structures, and performance calculations for diversity systems, multiple pulse radars, stationary processes, and threshold receivers. Prerequisite: EE 245. (Spring—evening)

346 **Communications Switching and Traffic Theory**

Switching network technology, step-by-step common control, stored program electronic switching systems. Traffic models. Engineering of multiple server systems, analysis of graded multiples and multistage connecting networks. Software issues, digital time division and store and forward switches. Analytical bounds on the complexity of switch networks, combined circuit and message switching. Current practice and practical issues. Prerequisite: EE 243 or permission of instructor. (Spring, even years—evening)

349 **Communications Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

371 **Simulation Methods for System Analysis** (3)

Survey of simulation languages. Techniques of model building for material- and machine-based systems. Treatment of these systems with notion of transactions and states. Modeling the dynamic processes of growth problems. Analog, hybrid, and digital methods for simulation treated by means of case studies; speed and cost of alternate computing procedures. Project-type problems used to illustrate simulation methods. Prerequisite: CSci 278 or permission of instructor. (Fall, odd years—evening)

372 **Analysis and Control of Large Systems** (3)

Systems as multistage decision processes. Analytical concepts of model making and matrix representations of large systems. Approximation by models of lower dimension—reduction to simplified models; decentralized systems. Differential games; computation of saddle points; construction of an equilibrium point. Prerequisite: EE 273. (Spring, even years—evening)

381 **Bioelectric Phenomena** (3)

Mathematical treatment of selected bioelectric phenomena. Membrane thermodynamics; membrane electrical potentials and subthreshold membrane effects; membrane dynamics. Solid-state phenomena in biology and medicine. Photoconduction. Mechanism of nerve propagation. Electrical models of the heart. Cell physiology. Quantum effects in biological systems. Prerequisite: EE 206, 281, 282, 283. (Fall—evening)

386 **Sensory-evoked Potentials II** (3)

A continuation of EE 286. Advanced lecture, discussion, and laboratory. Current topics in sensory-evoked potentials research; emphasis on clinical applications. Planning and conducting an advanced (clinical or research) project chosen to take maximum advantage of the student's technical background from an instrumentation, computer, and data analysis viewpoint. Prerequisite: EE 286 and permission of instructor. (Spring—evening)

389 **Medical Engineering Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Computer Science Graduate Courses

201 **Introduction to Computer Systems I** (3)

Introduction to programming digital computers in a macro-assembly language and higher-level procedural languages; techniques in machine control and memory addressing. Characteristics of different computer structures and the programming of such machines. Introduction to the structure of compiler languages; parsing of compiler language statements. Characteristics and choice of data processing languages. Prerequisite: CSci or EE 51 or equivalent; assembly language programming experience and permission of instructor. (Fall and spring—evening)

202 **Introduction to Computer Systems II** (3)

Introduction to combinational and sequential logic networks; analysis an-

synthesis of switching circuits using Boolean algebra; minimization techniques in the design of logical circuits; number systems and arithmetic in digital computers, digital computer architecture and the design of functional sub-units; design of memory, arithmetic, and units comprising a digital computer; information flow, timing, and control in large digital computers. Prerequisite: CSci 201 or permission of instructor. (Spring—evening)

208 **Computer Programming** (3)

Use of a macroassembler in structured programming. Input-output programming at the assembly level. Conditional assembling, access methods, and storage management. Memory management and I/O buffer pools. Introduction to the operating system, job control language, file structures. Program status and control, interrupt handling, reentrant and recursive subroutines. Prerequisite: CSci or EE 158; or CSci 201; or permission of instructor. (Spring—evening)

213 **Discrete Structures in Computing** (3)

Introduction to discrete mathematical structures used in computing. Sets, graphs, functions, mappings, lattices, groups, and semigroups. Combinatorial problems and enumerations. Finite-state machines, representations, identification, transitions, and reductions. Directed graphs, trees, and paths through a program. Regular expressions and relations between programs and computing machines. Prerequisite: CSci 51 and permission of instructor. (Fall and spring—evening)

214 **Data Structures** (3)

Computer data structures; arrays, items, pointers, lists, insertion and deletion, available space management, threaded lists, two-way lists, garbage collection and compactification. Push-down stacks, strings and files. Tree structures and searching; hash table searches, bubble, radix, and merge sorting. Sequential, index-sequential and random files; access methods; sorting of files. Subroutines, co-routines, macros, flags, relocation, and recursion. Buffer pools and buffer management, data management, and storage. List and string processing languages. Prerequisite: CSci 158 or 201; 213. (Spring—evening)

216 **Information Retrieval Systems** (3)

Information organization and retrieval of natural language data by digital computer systems; statistical, syntactic, and logical analysis of natural language used for retrieval systems; dictionary systems including thesaurus look-up and phrase structures; searching strategies and cataloguing. Input preparation and output structures; large-scale file structures and operating systems required for their use. Prerequisite: CSci 214 or permission of instructor. (Spring—evening)

219 **Interactive Computer Graphics** (3)

Display devices, CRT, point plotting and vector generation, character generators; display files, data structures, linear and area transformations, clipping and windows; graphic input devices; interrupt handling; scaling; perspective, projection, hidden line elimination; command languages, time-shared interactive graphics, software support. Prerequisite: CSci 214 or permission of instructor. (Fall—evening)

220 **Pattern Recognition** (3)

Applications of pattern recognition, vector spaces, estimation and samples; Bayes estimation; density functions; stochastic approximation; decision rules

in pattern recognition, minimal risk, Gaussian filters; bounds of risk, nearest-neighbor decision rules; clustering techniques, feature extraction, pattern recognition with *a priori* knowledge. Prerequisite: EE 204, CSci 214. (Spring—evening)

223 **Simulation and Heuristics** (3)

Techniques of deterministic and probabilistic simulation on the digital computer. Mathematics for simulation; design of systems modules; random number generation and testing. Markovian and bounded context systems, generation of stochastic variates; Monte Carlo techniques; heuristics; verification techniques; simulation languages. Prerequisite: CSci or EE 158, or CSci 201; and permission of instructor. (Fall—evening)

227 **Management Information Systems and Data Base Management** (3)

Concepts in management information systems. Commercial programming features of COBOL and PL/I. Inverted files and query systems. Editing, report generation, updating, and updating load. Tradeoff between direct access and indexed-sequential access. Maintaining large programming systems which lead to the need for data base management systems; construction of data base management systems. Survey of some existing data base systems. Relational data base concepts and future developments. Students will create and update a data base and interface to application programs. Prerequisite: CSci 208, 214. (Fall—evening)

232 **Automata Theory** (3)

Regular expressions including equality and transformations between sequential machines and regular expressions. Turing machines, recursive function, predicate calculus, and computability. Complexity of algorithms. Formal language theory including grammatical construction, recognizers, relationships between machines and grammars, and ambiguity. Random processes in sequential machines. Prerequisite: CSci 213. (Spring—evening)

237 **Computing Systems** (3)

Organization of large digital computer systems. Design of high-speed arithmetic units. Random access and associative memories; rotational storage devices; computer control and interrupt structures. Input-output channels and interfacing problems. Communications in digital computers. Introduction to multiple-access and time-sharing systems. Prerequisite: CSci or EE 154; or CSci 202. (Fall—evening)

239 **Comparative Computer Systems** (3)

Structures of computers and a general language for system description. History of different computer structures. Development of the operating system. Special purpose processors. Multiprocessors and large computing systems. Computer networks and time-shared systems. Comparison of computer families. Characteristics and philosophies of computer design of the major manufacturers. Introduction to performance evaluation and measurement. Effects of software and technology on computer structures. Prerequisite: CSci 237, 263. (Spring—evening)

240 **Theory and Practice of Microprogramming** (3)

Basic concepts, techniques, and theory of microprogramming as applied to the implementation of control systems for sequential machines. Microprogramming languages, assemblers, and hardware simulators, including specific applications of these to the design of current computer systems

and their interfaces with real-time systems. Prerequisite: CSci 237, 263. (Spring—evening)

245 **Advanced Computer Systems Theory I** (3)

Analytical models applied to computing systems. Determinance, deadlocks, concurrency, and synchronization of computer processes. Optimal task scheduling using linear graph theory. Concurrent processes in multiprocessors. Analysis of the overlap of I/O and CPU processing. Queuing theory applied to time-shared computer models. Analysis of secondary storage devices and effective data rate. Analysis of memory buffer pools and multiprogrammed memory allocation. Memory allocation and storage heirarchy operation and their effect on throughput and response time. Prerequisite: EE 204; CSci 237, 263. (Fall—evening)

246 **Advanced Computer Systems Theory II** (3)

Optimum secondary storage placement algorithms to improve throughput. Modeling of secondary storage operation and data staging. Analysis of memory allocation algorithms to improve system performance. Characteristics of computer system hardware and software to provide for multiprocessing, multiprogramming, and time-shared operation. Loosely and tightly-coupled multiprocessors. Analysis of front-end processors in data base operation and computer networks. System analysis of a large, time-shared, terminal-oriented transaction processing system. Prerequisite: CSci 245. (Spring—evening)

255 **Formal Languages, Correctness, and Structured Programming** (3)

Introduction to formal computer languages. Structured programming and block-oriented languages. Regular, context-free, context-sensitive, and unrestricted computer grammars. Parsing a language, syntax of languages, pushdown automata and their use in compiling. Top-down structured programming. Avoidance of GO TO statements. Correctness, termination, and equivalence of programs. The inductive assertion method. Termination methods based on well-ordered sets. Assertion languages, program schemes, fixed point methods, and inductive principles. Prerequisite: CSci 214. (Fall—evening)

256 **Design of Translators** (3)

Design of procedure-oriented computer languages. Semantics and pragmatics as they affect the design of translators, interpreters, and compilers. Top-down and bottom-up recognizers. Production of machine code. Syntax-directed compiling. Tables and their organizations in translators. Optimizing compilers; compiler-compilers. Prerequisite: CSci 214. (Spring—evening)

263 **Digital Computer Programming Systems** (3)

Design of computer systems software. Design and programming of an assembler and loader. Multiprogrammed job control including linking, loading, linkage-edit, relocatability, region size, and status switching. Design of dispatchers and monitors. Design of utility programs. Input-output programming and control. Communications among components of the operating system. Prerequisite: CSci 208, 214. (Fall—evening)

267 **Operating Systems I** (3)

Introduction to the operating system for batch-operated multiprogrammed computer systems. Software components which constitute the operating system. Facilities of the macro-assembler which utilize the operating

system; loading and linking routines; initializing programs and tasks; dispatching and the interrupt mechanisms. Memory management in fixed and variable partitions; device and storage management. Input-output control and use of access methods. Performance evaluation of a multiprogrammed batch-operated system. Prerequisite: CSci 263. (Fall—evening)

268 **Operating Systems II** (3)

Introduction to operating systems for time-shared and multiprocessor computer systems. Processor management in a multiprocessor system, deadlocks, processor utilization, and I/O management. System availability and fail-soft mechanisms. Time-slicing and time-sharing operating systems and subsystems; transaction processing subsystems; memory management in a paged and segmented virtual memory system. Performance of the operating system. Computer network software and an introduction to the computer as a utility. System security and large data base systems. Prerequisite: CSci 267. (Spring—evening)

278 **Analog and Hybrid Computers** (3)

Analog computer components and electronics. Slow analog computer solutions of linear and nonlinear differential equations. System simulation and modeling on the analog computer. Introduction to the iterative analog computer. Transfer function simulation and use in control theory. The hybrid computer, digital logic, and digital computer control. Digital-to-analog and analog-to-digital converters and interfaces. Optimization methods on a hybrid computer. Parameter variations and searching methods. Prerequisite or concurrent registration: CSci or EE 154; or CSci 202; or permission of instructor. (Fall—evening)

281 **Applications of Numerical Methods I** (3)

Basic numerical methods with emphasis on their application to engineering problems. Error sources and error control; numerical representation of functions; over-determined systems; eigenvalues and eigenvectors; introduction to nonlinear equations; initial value and boundary value problems for ordinary differential equations. Theoretical concepts such as order of accuracy, Richardson's extrapolation, norm, stability, and convergence. Some modern methods such as spline approximation and the QR algorithm for eigenvalues. (Fall—evening)

282 **Applications of Numerical Methods II** (3)

A continuation of CSci 281. Systems of nonlinear equations; numerical optimization; numerical solution of common partial differential equations of engineering; methods for hyperbolic, parabolic, and elliptic problems; introduction to finite element methods. Prerequisite: CSci 281. (Spring—evening)

*285 **Approximation of Functions and Data Representations** (3)

Review of linear spaces; least squares, orthogonal functions; nonlinear techniques, gradient search methods; parameter estimation with discrete data; Tchebysheff approximation; approximation and curve fitting by spline functions and Bernstein polynomials. Prerequisite: CSci 281. (Fall—evening)

286 **Numerical Methods in Engineering I** (3)

Computational methods for solution of systems of linear algebraic equa-

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

tions and for the solution of the algebraic eigenvalue problem. Emphasis on accuracy and efficiency. Methods for banded and other sparse systems. Methods for parallel and pipeline processer computers. Prerequisite: CSci 281 and knowledge of linear algebra. (Spring—evening)

287 **Numerical Methods in Engineering II** (3)

Computational methods for solution of systems of ordinary differential equations: single-step methods, general multistep methods; convergence and stability analysis, methods for stiff equations, step size control and control of order. Prerequisite: CSci 281 and knowledge of differential equations. (Spring—evening)

288 **Numerical Methods in Engineering III** (3)

Computational methods for solution of boundary value problems in both ordinary and partial differential equations: shooting methods, finite difference methods, functional approximation methods, invariant imbedding, method of lines, treatment of boundaries in multidimensional problems. Prerequisite: CSci 282 and knowledge of differential equations. (Fall —evening)

289 **Numerical Methods in Engineering IV** (3)

Computational methods for solution of initial value problems for partial differential equations: method of lines, consistency, stability, convergence; explicit and implicit finite difference methods, alternating direction methods, high-order methods. Prerequisite: CSci 282 and knowledge of partial differential equations. (Fall—evening)

298 **Research** (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299-300 **Thesis Research** (3-3)

(Fall and spring)

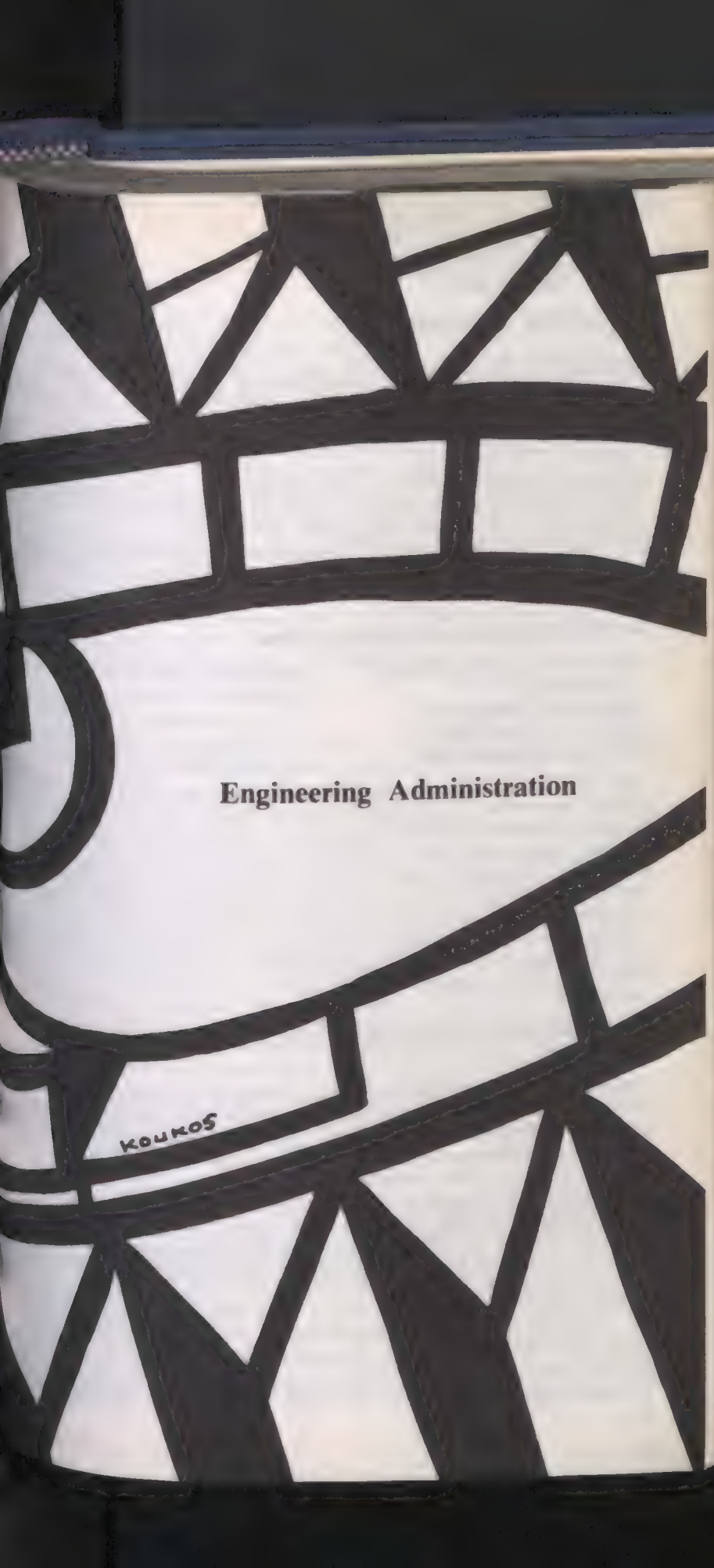
391 **Computer Science Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)





Engineering Administration

Engineering Administration

Professors P.A. Crafton, P.S. Shane, J. Kaye, M. Apstein *(Research)*, S. Rothman *(Chairman)*, H.M. Steiner, S.B. Levin *(Research)*, J.V.R. Kaufman *(Research)*
Professorial Lecturers B.B. Bright, G.M. Coburn, J. Gupta, J. Pachter, J.B. Du Peza, C.W. Fotis
Associate Professors J.B. Smith, Jr., R.N. Millen
Associate Professorial Lecturers E. Volgenau, R.L. Paullin, D.R. Levin, A. Hoshovsky, L.M. Blakey, R.H. Deane, R.F. Sears
Assistant Professorial Lecturers W.A. Goetz, A.L. D'Ambrosio, R.J. Lynch, Jr., P.G. O'Neill, K. Lamar, J.R. Margulies, S. Ficairo, T.L. Griswold, M. Novinsky, T. Trybul

Graduate Fields and Areas of Concentration

Administration of Research and Development
Construction Management
Engineering Administration
Environmental Management
Information Systems Management
Marketing of Technology
Systems Analysis and Management
Technology and Public Affairs
Transportation Management

Programs in Engineering Administration lead to the degrees of Master of Engineering Administration and Doctor of Science and to the Professional degree. Programs in Administration of Research and Development, Construction Management, Environmental Management, Information Systems Management, Marketing of Technology, Technology and Public Affairs, and Transportation Management lead to the degree of Master of Engineering Administration. Programs in Systems Analysis lead to the degrees of Master of Science and Doctor of Science and to the Professional degrees. A student must be accepted in a graduate program in order to receive credit for any graduate courses taken to satisfy degree requirements.

THE MASTER OF ENGINEERING ADMINISTRATION DEGREE PROGRAM

The principal objective of the program leading to the degree of Master of Engineering Administration is to prepare students whose undergraduate education was in engineering, natural science, or mathematics for positions of managerial responsibility in technological and scientific organizations in industry, government, or the armed services.

The program is designed to help the student achieve a broad understanding of the administrative process. Although years of experience are required to develop the skills, insight, and mature judgment which distinguish an effective manager in technological and scientific organizations, a graduate professional management curriculum can give the student an effective start as a manager. The curriculum provides an opportunity to gain an understanding and to develop useful managerial skills in the functional areas of engineering administration. One of the major purposes is to assist the student in forming the habit of examining problems from an overall administrative point of view. The individual's own particular experience, and the explicit process of relating this experience to

graduate study, provide each student with a personal frame of reference to interpret management in a rapidly changing world.

Successful education for engineering administration implies an understanding of what it is that an engineering manager must do, an analysis of the broad functions involved in management, and a detailing of modern methods useful in making and executing decisions in the management of technological and scientific organizations. It is the aim of the School, therefore, to keep alive a spirit of general inquiry and a decision-making orientation.

The management of technological organizations is one of the most difficult challenges of our times. The professional engineering manager today must understand not only currently developing technologies but also the rapidly changing marketplace where these technologies are applied for society's benefit. The engineering administrator is the link between these dynamic technologies and the needs of society in general.

In summary, the program of study has for its objective an educational experience which will contribute to the development of managers possessing a combination of technical know-how and administrative skill.

Admission

In addition to the requirements for admission to graduate study (see page 35) applicants for programs leading to the degree of Master of Engineering Administration must meet the following requirements: (1) The applicant must have an adequate knowledge of the principles of human relations, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, *Introduction to Engineering Administration;* EAd 160, *Introduction to Engineering Economic Analysis;* and EAd 170, *Basic Quantitative Methods for Engineering Administration.* (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. (3) A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. A student is not permitted to repeat any of the undergraduate prerequisite courses. Credit for prerequisite courses is not applicable toward the degree of Master of Engineering Administration, and, unless approved by the Department chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

Core Courses

The following courses are required for the Master of Engineering Administration degree and must be taken prior to any other course in the program:
EAd 211–12 Engineering Administration (3–3)
EAd 269 Elements of Decision-making and Problem-solving (3)

General Program

ENGINEERING ADMINISTRATION

Study in engineering administration provides the conceptual depth in manage-

ment practice and knowledge needed by technical and scientific personnel wh
are confronted with increasing demands and complexities. Technical knowledg
is complemented by an understanding of theory and practice in managemen
action. Engineering management is a logical development of a technologic
society. The program is designed to provide engineers with a knowledge an
proficiency in the administration of engineering and science. It emphasizes us
of deliberative, purposive study of general administrative problems and oppo
tunities, as well as the study and use of specific knowledge and methods needed
to solve administrative problems and to explore opportunities. A program
prescribed for each student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Ad
ministration (3) (non-thesis)
Electives (18–21). Electives are chosen from the Department of Engineering
Administration and other departments of the University, but no more tha
two courses may be chosen from other departments.

Areas of Concentration

Students wishing to pursue a specific area of concentration, as opposed to fol
lowing the general program in EAd, may select one of the following programs

ADMINISTRATION OF RESEARCH AND DEVELOPMENT

The program is designed to prepare students for responsible managerial pos
tions in organizations conducting technological or scientific research and de
velopment and in organizations planning and administering programs of tech
nological or scientific research and development. A program is prescribed for
each student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 207 The Personnel Function for Engineering Administration (3)
EAd 255 Administration of Research and Development (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering
Administration (3) (non-thesis)
Electives (12–15)

CONSTRUCTION MANAGEMENT

Construction Management encompasses those managerial functions in an or
ganization that plans and executes major construction work. This can take
place in the field, in the project office, or in a main office. Due to the inherent
complexity of present-day engineering, engineers need to know management
as well as basic planning, design, and construction methods. They need to know
construction developments, problems of contracts and specifications, techniques
of scheduling and control, estimating, labor relations, and industrial or man
agement psychology.

This program prepares the engineer for the task of marshalling men, mate
rials, machines, and money as functions of time, cost, weather, and human

nature to plan and build structures. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 241 Construction Management I (3)
EAd 242 Construction Management II (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (9–12)

ENVIRONMENTAL MANAGEMENT

This program prepares students for responsible managerial positions in organizations conducting environmental control and in organizations planning and administering programs in the prevention and control of environmental pollution. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 221–22 Environmental Management (6)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (9–12)

INFORMATION SYSTEMS MANAGEMENT

Managers of technological and scientific organizations encounter a variety of management information systems required for day-to-day operations and long-range decisions. This program helps to provide managers with the competence to use such systems effectively. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 254 Automatic Data Processing Systems (3)
EAd 251 Management of Computer Organizations (3)
EAd 295 Management of Technical Information (3)
EAd 321 Management Information Systems (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (6–9)

MARKETING OF TECHNOLOGY

As the American economy matures and Americans survey the spectrum of options available to them, it is apparent that scientific and engineering outputs

must be sold in world-wide competition both at home and abroad. The trained specialist is becoming more important than ever before in performing the selling function.

The objective of this program is to prepare students for responsible positions in marketing technical products and services. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 293 Technical Enterprises (3)
EAd 294 Marketing of Technology I (3)
EAd 311 Marketing of Technology II (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (9–12)

TECHNOLOGY AND PUBLIC AFFAIRS

This program prepares students for responsible positions requiring managerial decision-making on matters that involve the impact of technology on public policy and that concern the general interrelationship between modern technology and public affairs. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 386 Advanced Topics in Management (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (12–15)

TRANSPORTATION MANAGEMENT

The Transportation Management program prepares students for responsible positions in the management of transportation systems or the formulation of transportation policy. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 265 Transportation Management I (3)
EAd 266 Transportation Management II (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (9–12)

THE MASTER OF SCIENCE DEGREE PROGRAM

Systems Analysis

This program leads to the degree of Master of Science and is administered by the Department of Engineering Administration. Students are prepared for responsible positions in the practice of systems analysis.

ADMISSION

Admission requirements for the Master of Science degree in Systems Analysis include a bachelor's degree in engineering or natural sciences, or a major in mathematics from a recognized institution. Applicants to graduate study must, in addition, meet the following requirements: (1) the applicant must have an adequate knowledge of the principles of human relations, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, *Introduction to Engineering Administration;* EAd 160, *Introduction to Engineering Economic Analysis;* and EAd 170, *Basic Quantitative Methods for Engineering Administration.* (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. (3) The student is required to earn the grade of *C* or better (unless upon admission the requirement is stipulated to be a grade of *B* or better) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. A student is not permitted to repeat any of the undergraduate prerequisite courses. Credit for prerequisite courses is not applicable toward the degree of Master of Science in Systems Analysis, and, unless approved by the Department Chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

PREREQUISITES (or equivalents)

EAd 160 Introduction to Engineering Economic Analysis (3)
EAd 170 Basic Quantitative Methods for Engineering Administration (3);
or ApSc 115 Engineering Analysis III (3)
CSci 51 Applications of Computers (3)

REQUIRED COURSES

EAd 211–212 Engineering Administration (3–3)
EAd 269 Elements of Decision-Making and Problem-Solving (3)
EAd 281–282 Systems Analysis and Management (3–3)
OR 201 Survey of Operations Research Methods I (3)
OR 202 Survey of Operations Research Methods II (3)
EE 202 Linear System Theory I (3)

For Thesis Option

EAd 299–300 Thesis Research (3–3)

For Nonthesis Option

OR 273 Digital Systems Simulation (3)
EE 203 Linear Systems Theory II (3); or EAd 283 Systems Engineering I (3)
EAd 297 Problems in Engineering Administration (3)

THE PROFESSIONAL DEGREE PROGRAM

The Department of Engineering Administration has established the Professional degree program for those students who are interested in pursuing course work beyond the Master's degree, with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or to the degree of Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in engineering administration.

In the Professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with flexibility to adapt successfully to changing circumstances.

Each student's program is planned considering background and needs, subject to departmental requirements.

Professional Degree Study Programs

The Professional degree program provides post-Master's degree graduate study in areas in which the Department has adequate facilities and resources. Upon departmental approval, the student may select courses in other University departments to meet specific needs or objectives. Courses can, upon department approval, be chosen in the following areas:

Administration of Research and Development
Construction Management
Engineering Administration
Environmental Management
Information Systems Management
Marketing of Technology
Systems Analysis and Management
Technology and Public Affairs
Transportation Management

A student's program of study will provide concentration in a selected area and include courses from other areas. A program consists of a minimum of 30 semester credit hours of approved graduate courses beyond a Master's degree, six of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of credit hours.

ADMISSION

Admission to graduate study toward the Professional degree requires appropriate bachelor's and Master's degrees from recognized institutions, and evidence of capacity for productive study. To study toward the Professional degree of Engineer (in Engineering Administration), an applicant must possess a bachelor's degree in engineering; for the Professional degree of Applied Scientist (in Engineering Administration), an applicant must possess a bachelor's degree in mathematics or a natural science. In both cases a Master's

degree in engineering administration or a related field is required. Applicants having equivalent backgrounds of study may be considered. At least a 3.00 average in graduate study is required.

Those applicants having Master's degrees in engineering, natural science, or mathematics will be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269), plus one elective, with a grade of *B* or better; and completion of the Master's Comprehensive Examination with a superior score.

Those applicants wishing to pursue Systems Analysis must possess a Master's degree in systems analysis or a related field. Applicants having Master's degrees in engineering, natural science, or mathematics will be required to complete the five courses required for the Master of Science (Systems Analysis) degree (EAd 211, 212, 269, 281, 282) with a grade of *B* or better. In addition, the individual must complete the Master's Comprehensive Examination with a superior score.

ADMISSION TO CANDIDACY

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. No courses taken by the applicant to meet these prerequisite requirements and conditions can be applied toward the Professional degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of only nine hours of this additional course work can, with the approval of the adviser, be applied toward meeting degree requirements.

TRANSFER CREDIT

Up to six semester credit hours of satisfactory study (with grades of *A* or *B*) in a graduate program beyond a Master's degree will be considered for transfer toward the Professional degree. They must have been earned within five years of admission to candidacy for the Professional degree, and must be appropriate to satisfy requirements for the Professional degree. The student must, with the approval of the adviser, petition the Department Chairman for such transfer.

PROGRAM OF STUDY

Upon admission the student is assigned a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the Comprehensive Examination, and Professional degree requirements. The program of study for each student must be approved by the student's adviser and the Department Chairman. An area of concentration is selected to prepare the student to undertake the professional project. Other courses are selected either to support work on the planned projects or to meet other needs. With prior approval of the adviser, up to nine credit hours of study may be taken in other departments of instruction in the University if such work is pertinent to the program. These nine hours include the six potential transfer credits.

PROFESSIONAL PROJECT

Each degree candidate must engage in a professional project on which the candidate will submit an acceptable report of an analysis and solution of a "real

world" problem in engineering administration. The student is to demonstrate ability to apply newly acquired knowledge to identify a problem, determine a significant problem, work toward a solution, and communicate the results in writing.

When the course work is essentially completed, the candidate, with the adviser's approval, will register for EAd 395–96 *Seminar: Professional Project* (3–3) to receive guidance in the professional project. Before registration the candidate should have identified an area or project to study, and prepared a study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the Department Chairman, with approval of the project adviser. Six semester credit hours are assigned for work on the project.

SCHOLARSHIP

No student studying for the Professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B*, or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality point average of at least 3.00 to receive the degree.

TIME TO COMPLETE PROFESSIONAL DEGREE REQUIREMENTS

A full-time student in the Professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

RESIDENCE AND CONTINUOUS STUDY

All work for the degree must be done in residence (on the campus) except when special permission is granted by the Chairman of the Department. The student must maintain continuous registration in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the Professional degree program under whatever conditions and regulations are in effect at that time.

DOCTORAL STUDY

Programs in Engineering Administration and in Systems Analysis and Management leading to the degree of Doctor of Science provide advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission to Doctoral Study

All applicants must meet the general requirements for admission to doctoral study stated on page 32.

Applicants for doctoral study in Engineering Administration must have a Master's degree, with a superior record of academic achievement in Engineering Administration or a related field. Those applicants having Master's degrees in engineering, natural science, or mathematics will be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) plus one elective, all with a grade of *B* or better; and completion of the Master's Comprehensive Examination with a superior score.

Those applicants wishing to pursue Systems Analysis and Management must possess a Master's degree in systems analysis or a related field. Applicants having Master's degrees in engineering, natural science, or mathematics will be required to complete the five courses required for the Master of Science (Systems Analysis) degree (EAd 211, 212, 269, 281, 282) with a grade of *B* or better. In addition, the individual must complete the Master's Comprehensive Examination with a superior score.

An applicant is admitted to candidacy for the degree after he has completed all course and language requirements, and qualifying examinations.

Programs of Study

Major fields leading to the degree of Doctor of Science are available in Engineering Administration and in Systems Analysis and Management. In addition to the major field, one or two minor areas of concentration are normally required, which may be chosen from the areas administered by this Department and/or from appropriate areas available in other departments of the University. The general requirements for doctoral study are stated on pages 31–35.

ENGINEERING ADMINISTRATION UNDERGRADUATE COURSES

150 **Introduction to Engineering Administration** (3)

The interrelationships of engineering, science, and management; conceptual foundations for interaction of human factors in individuals, groups, and the social environment of engineering activities. Familiarization with typical activities of engineering managers and with factors bearing on the motivation of engineers and on engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to the complete management process studied in EAd 211–12. **(Fall, spring, summer)**

160 **Introduction to Engineering Economic Analysis** (3)

Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit/cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis. **(Fall, spring, summer)**

170 **Basic Quantitative Methods for Engineering Administration** (3)

An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability statistics, and operations research. **(Fall, spring, summer)**

ENGINEERING ADMINISTRATION GRADUATE COURSES

201 Management for Engineers and Scientists (3)

Basic principles of engineering administration; management functions of planning, organizing, directing, and controlling; emphasis on industrial, scientific, and engineering environments. Open to students in programs outside the Department of Engineering Administration and open to candidates for the Master of Science degree in the School of Engineering and Applied Science. May not be taken by candidates for the degree of Master of Engineering Administration or for the degree of Doctor of Science with a major field in Engineering Administration. Open to advanced undergraduate students with permission of instructor. Students who receive credit for EAd 201 cannot receive credit for EAd 211–12. (As arranged)

204 Administration of Engineering Contracts (3)

Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and administration of the contract to completion; considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services. (Fall and spring)

207 The Personnel Function for Engineering Administrators (3)

Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment. (Fall and spring)

210 Engineering Law (3)

Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research and developmental contracts. (Fall and spring)

211–12 Engineering Administration (3–3)

Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Students who receive credit for EAd 211–12 cannot receive credit for EAd 201. Prerequisite: EA 150, and 160, or equivalent. (Fall, spring, summer)

213 Case Analysis in Engineering Administration (3)

Written analysis and class discussion of cases involving application of the principles of engineering administration and use of the scientific method. (Fall, even years)

221–22 Environmental Management (3–3)

The spectrum of technical, economic, political, administrative, and social forces influencing the quality of our environment. Review of governmental and industrial programs to combat pollution of the air and water

and to control pesticides, noise, and radiation. Historical development of legislation dealing with environmental science and management. Review of pending legislation involving environmental and energy matters; theoretical aspects of specific management problems. (Academic year)

231 **Program Management** (3)

Programs and projects are widely used in industry and government to facilitate the management of technical undertakings. Management science, the systems approach, and traditional managerial concepts are applied to a variety of typical cases. (Spring)

241 **Construction Management I** (3)

Contract negotiations; aspects of contracts and specifications important to management. Construction estimating and cost allocation in heavy and building construction; budgeting and accounting concepts. (Fall)

242 **Construction Management II** (3)

Construction administration: organization, construction planning, and scheduling. Industrial relations and human factors in construction management, work measurement, programming and progressing, project management and control. (Spring)

243 **Construction Management III** (3)

Managerial problems associated with advanced methods of construction and equipment; trend of mechanization; equipment policy and depreciation. (Fall)

251 **Management of Computer Organizations** (3)

Planning, organizing, and control of computer operations. Management of a computer organization as an independent service bureau or as an integral part of a larger organization. Supervision of professional and subprofessional computer personnel. Prerequisite: EAd 254. (Fall)

253 **Production Management** (3)

Planning, organizing, and control of production; forecasting techniques; material management; methods of loading and scheduling production processes; electronic methods in production control. Organization and administration of the plant engineering function with emphasis on maintenance control programs. (Spring)

254 **Automatic Data Processing Systems** (3)

Logic of computers, hardware and software, systems analysis for data processing applications, systems design, systems economics. Impact on decision-making, business, and society. (Fall and Spring)

255 **Administration of Research and Development** (3)

The study of technological innovation as a vital part of the acquisition process; the role of the technical administrator in utilizing organization, plans, and control to accomplish research and development objectives. (Fall and spring)

261 **Economic Analysis in Engineering Planning** (3)

Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or equivalent. (Fall and spring)

265 **Transportation Management I** (3)

Integration of social, technical, economic, and political considerations which shape transportation systems and their management. Course material focuses on industry and local, state, and federal government programs in transportation. A management study of a local, regional, national system will be required. (Fall)

266 **Transportation Management II** (3)

Legal aspects of transportation systems and their management. (Spring)

269 **Elements of Decision-Making and Problem-Solving** (3)

Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and subjective factors. Managerial economics. Engineering economy—model building, testing, solving. Replacement under certainty or risk. Control-general, control charts, sampling inspection. Experimentation to differentiate variables, build models-canons of induction, statistical tests, analysis of variance, linear regression. Application to nonmathematical formulations. (Fall, spring, and summer)

281 **Systems Analysis and Management I** (3)

The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback. (Fall)

282 **Systems Analysis and Management II** (3)

Extension and elaboration of systems analysis techniques, including their application to industry, input-output structures, human behavior in organizations, and military situations. Prerequisite: EAd 281. (Spring)

283 **Systems Engineering I** (3)

Concept of system structure and organization. Linear and nonlinear systems analysis; dynamics and stability of systems. Introduction to optimization methods and systems simulation techniques. (Fall)

284 **Systems Engineering II** (3)

Design of systems; simulation and modeling of systems; adaptive systems; system optimization. Prerequisite: EAd 283. (Spring)

285 **Seminar: Administrative Problems** (3)

Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit. (Fall and spring)

293 **Technical Enterprises** (3)

Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. For those within technical firms and those within government who depend on technical firms as suppliers. (Fall)

294 **Marketing of Technology I** (3)

Marketing industrial goods and high-technology projects; special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy. (Spring)

295 Management of Technical Information (3)

Needs and objectives of technical information systems, functions involved in technical information, storage and retrieval, abstracting, computer usage in technical information systems, system organization. Prerequisite: EAd 251. (Spring)

297 Problems in Engineering Administration (3)

Project course providing the student with the opportunity to apply the various concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the instructor. Open to Master's degree students only. Departmental. (Fall, spring, summer)

298 Research (arr.)

Basic or applied research in engineering administration or systems analysis. May be repeated for credit. Open to Master's degree students only. Departmental. (Fall, spring, summer)

299-300 Thesis Research (3-3)

(Fall and spring)

311 Marketing of Technology II (3)

Continuation of EAd 294. Special attention to marketing research, negotiation, and international marketing. Required for Master's degree candidates in the Marketing of Technology program. Prerequisite: EAd 294. (Fall, even years)

321 Management Information Systems (3)

Study of the development and management of information systems used by middle and higher management of technological and scientific organizations, in the control of many facets of the organization at all managerial levels. Required for Master's degree candidates in the Information Systems Management program. Prerequisite: EAd 295. (Fall, odd years)

386 Advanced Topics in Management (3)

Reading and discussion of classic and important recent literature concerning the philosophy and application of management principles. (Fall, odd years)

387 Technological Forecasting (3)

Concepts and methodology: normative and exploratory forecasting, resource allocation and forecasting, technology transfer, technological change and its effects on forecasting, technology assessment. (Spring, even years)

388 Cost Effectiveness (3)

Concepts of evaluation of engineered systems, current methods and trends in methodology, system resource requirements, probability and decision theory in cost effectiveness studies, systems approach to cost effectiveness studies. (Spring, odd years)

394 Advanced Study (arr.)

Limited to Departmental Professional degree students. May be repeated for credit. (As arranged)

395–96 Seminar: Professional Project (3–3)

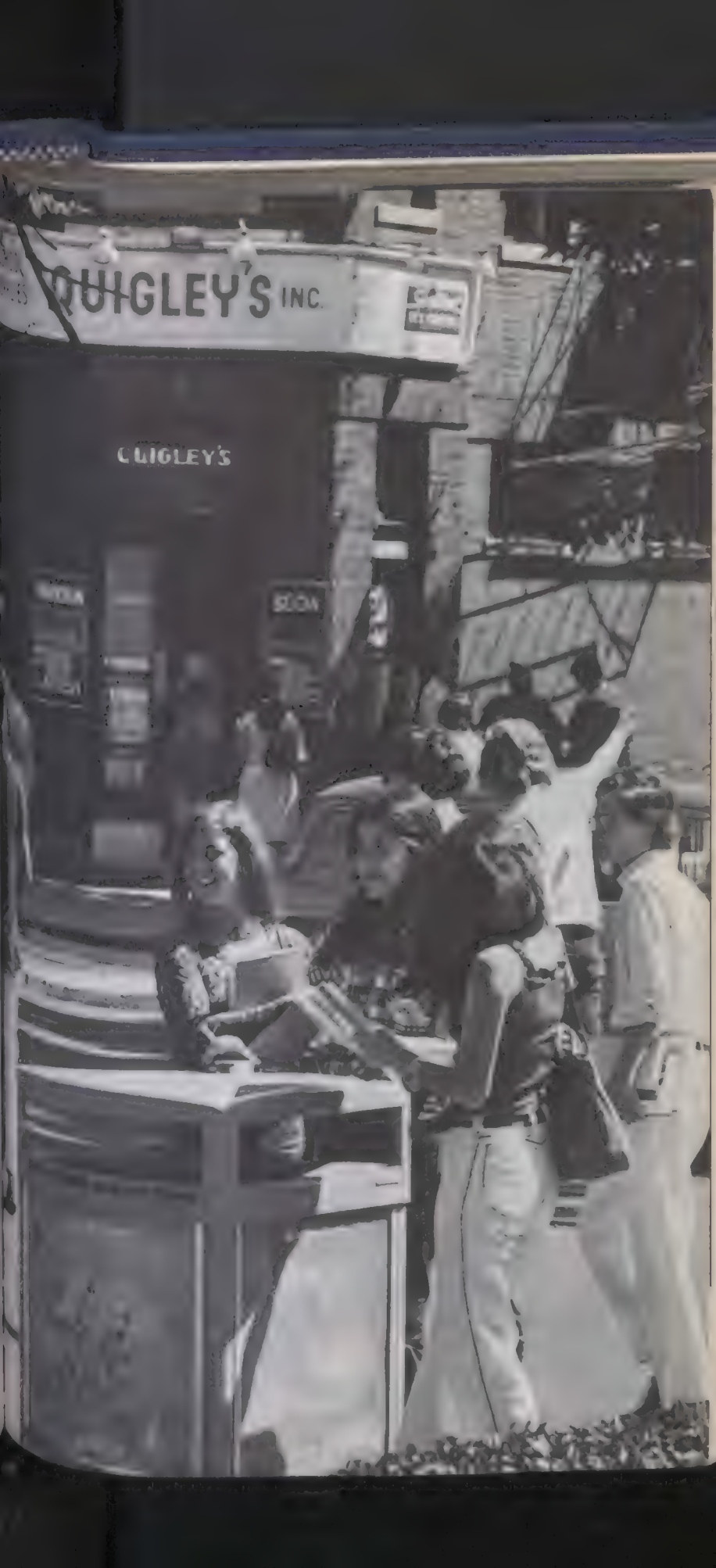
Limited to Departmental Professional degree candidates. (As ar ranged)

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)


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Operations
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Operations Research

Professors W.H. Marlow, D. Gross *(Chairman)*, N.D. Singpurwalla, A.V. Fiacco, G.P. McCormick, J.E. Falk
Professorial Lecturers B. Cosby, Jr., C.C. Sherbrooke
Associate Professorial Lecturers S.J. Balut, G. Bennington, F. Frishman, J.L. Horowitz, G.R. McNichols, D.A. Pierce
Assistant Professors J.D. Marsh, Jr., Z. Barzily *(Research)*
Assistant Professorial Lecturers J.W. Blankenship, A.L. Haines, L.J. Ricco

Programs in operations research lead to the degrees of Master of Science and Doctor of Science, and to the Professional degree of Applied Scientist.

MASTER'S STUDY

The objective of the Master's program in operations research is to prepare students with appropriate undergraduate backgrounds for in-depth study of analytically oriented techniques of management decision-making and their applications.

Expanded scientific, statistical, and mathematical knowledge, combined with growing needs in technological as well as social areas, have created increased demands for individuals trained in operations research. The discipline of operations research uses scientific principles supported by statistical and mathematical methodology to study the function and structure of complex industrial, military, and social systems in an effort to evaluate the probable effects of proposed courses of action, to establish criteria to judge the effectiveness of these courses, and to assist in the making of optimal decisions. The program in operations research provides a scientific basis for solving problems involving the interaction of many factors and organizational components in the interests of the whole system. This breadth of interest is an example of the "systems approach" in the sense that a system is an interconnected complex of functionally related components. Most operations research efforts begin with specific aspects of a general problem and proceed to consideration of the system as a whole. Just as the engineer may start with the study of subsystems or components of a general problem, so may the operations research analyst.

Admission

In addition to the requirements for admission to graduate study (see page 25), the applicant for the program in operations research leading to the degree of Master of Science must have an adequate knowledge of probability and statistics. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: ApSc 115, *Engineering Analysis III;* and Stat 191, *Probabilistic and Statistical Methods for Operations Research.* It is generally possible to take these courses concurrently with courses taken for graduate credit; however, in no case may these undergraduate courses fulfill any part of the requirements for the Master's degree.

Required Courses

Core courses required in the field of operations research are OR 201, 202, 209,

210, and 299–300 (for those electing a thesis) or 291 (for those not electing a thesis). Students must complete OR 201, 202, 209, and 210 before attempting any other courses; however, in certain cases, permission may be granted for concurrent registration. Students electing OR 291 normally complete this course in the last semester of the program. The remainder of the program is selected, with the approval of the adviser, in an area of concentration from courses in the Department of Operations Research. Appropriate courses from other departments of the University may also be approved as electives.

Areas of Concentration

The goal of the Department of Operations Research is to provide programs flexible enough to accommodate both those who are interested in applications and those who are interested in theory. Specific areas of concentration and suggested departmental electives follow:

GENERAL OPERATIONS RESEARCH

OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 261: Theory of Games
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, other courses within the Department may be elected.

ENERGY SYSTEMS

OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 271: Forecasting Techniques
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Civil, Mechanical, and Environmental Engineering.

LOGISTICS ENGINEERING

OR 237: Logistics Planning
OR 251: Linear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 275: Introduction to Scheduling
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Economics, Business Administration, Management Science, and Electrical Engineering and Computer Science.

MANAGEMENT SCIENCE

OR 232: Applications of Linear and Nonlinear Optimization Theory

OR 237: Logistics Planning
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Business Administration, Economics, Engineering Administration, and Management Science.

MATHEMATICAL MODELING IN INFORMATION SYSTEMS

OR 251: Linear Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory

With the approval of the adviser, courses may be elected from the Departments of Electrical Engineering and Computer Science, Engineering Administration, and Management Science.

MATHEMATICAL OPTIMIZATION

OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 261: Theory of Games
OR 275: Introduction to Scheduling

With the approval of the adviser, courses may be elected from Applied Science and the Department of Mathematics.

MODEL BUILDING FOR TRANSPORTATION FLOWS

OR 231: Theory of Traffic Flow
OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Engineering Administration; and Urban and Regional Planning; and from the National Law Center.

OPERATIONS RESEARCH IN INDUSTRIAL ENGINEERING SYSTEMS

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 271: Forecasting Techniques

OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

QUANTITATIVE DECISION-MAKING FOR PUBLIC POLICY

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 235: Operations Research in Public Policy
OR 236: Operations Research in Social Systems
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Economics; Public Administration; and Urban and Regional Planning.

STOCHASTIC MODELING

OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Department of Statistics.

PROFESSIONAL DEGREE PROGRAM

A program of advanced study and research leads to the degree of Applied Scientist. The program is designed to provide an educational opportunity for students interested in pursuing post-Master's study with emphasis on applied subject matter rather than on basic research.

Admission

In addition to the general requirements for admission to Professional degree study (see pages 29–30), admission requires an appropriate Master's degree from a recognized institution and evidence of a capacity for productive work as indicated by prior scholarship. The applicant must also possess a bachelor's degree in either engineering, mathematics, or administration. In certain cases, applicants having an equivalent quantitative background may be considered for admission by the Department.

Program of Study and Requirements

The program of study consists of an applied operations research major and an applied out-of-department minor. A minimum of 30 semester hours is required to earn the Professional degree, including a minimum of 12 hours in operations research, Stat 201–202, and a three-hour Professional degree project. In addi-

tion, an applied nine-hour minor outside the department is required. Appropriate minor areas include economics; engineering administration; systems analysis, computer science; systems science, networks and controls; urban and regional planning; transportation systems; environmental engineering; and energy systems.

DOCTORAL STUDY

Programs in operations research leading to the degree of Doctor of Science provide advanced study and research to enable students to extend their fields of knowledge and to enhance their career opportunities in research, analysis, management, administration, or education.

Admission

In addition to the general requirements for admission to doctoral study (see page 32), the applicant for the doctoral program in operations research must have a Master's degree, with a superior record of academic achievement. Outstanding professional performance is also considered in evaluating applicants.

Programs of Study

Doctoral programs are planned so that the student may obtain adequate breadth in operations research and sufficient depth in areas of specialization which will enable the completion of a dissertation that will be a significant contribution to the field. Possible areas of concentration include mathematical programming, sequencing and scheduling, inventory, queuing, and reliability. In addition to the major in operations research, two minor areas of concentration are normally required. One minor generally is in applied science, mathematics, or statistics. The second minor may be chosen from areas of concentration within the Department or from appropriate areas available in other departments of the University, such as Business Administration; Civil, Mechanical, and Environmental Engineering; Economics; Electrical Engineering and Computer Science; Engineering Administration; Health Care Administration; Management Science; and Urban and Regional Planning. The general requirements for doctoral study are stated on pages 31–35.

OPERATIONS RESEARCH GRADUATE COURSES

201 Survey of Operations Research Methods I (3)

Basic concepts and techniques of operations research as applied to problems in industrial, governmental, and military decision making. Allocation models; including the simplex procedure of linear programming; transportation and assignment models; queuing theory; inventory theory; game theory; and decision-making under uncertainty. Prerequisite: ApSc 115 or equivalent. (Fall and spring)

202 Survey of Operations Research Methods II (3)

Simulation, Monte Carlo techniques; networks; integer programming; introduction to nonlinear programming; dynamic programming; reliability

and replacement. Prerequisite: OR 201 or permission of instructor. (Fall and spring)

209 **Mathematics in Operations Research I** (3)

Fundamental methods and practical procedures for deterministic decision models in operations research involving a number of variables. Applications of linear models for resource allocations. Applications to data representation and algorithmic procedures for linear and nonlinear optimization models. Applications of linear algebra and real multivariate analysis. (Fall)

210 **Mathematics in Operations Research II** (3)

Fundamental methods and practical procedures for stochastic decision models in operations research involving applications of complex variables. Applications of linear differential, difference, and differential-difference systems to various areas in operations research. Applications of modern numerical methods. (Spring)

231 **Theory of Traffic Flow** (3)

Definitions and measurement of traffic stream parameters; dynamic theories: follow-the-leader models of traffic flow; kinematic theories and fluid analogies; traffic cybernetics; statistical distributions and queuing theory; stochastic approaches to static delay problems; simulation of traffic problems. Prerequisite: ApSc 115 or equivalent. (Spring, odd years)

232 **Applications of Linear and Nonlinear Optimization Theory** (3)

Introduction to penalty-function methods for solving linear and nonlinear optimization problems through use of existing computer codes. Formulation of optimization models in application areas of structural design, nutrition, pollution control, resource allocation, biology, economics, psychology, statistics, and chemical processes. Admission by permission of instructor. (Fall)

235 **Operations Research in Public Policy** (3)

Quantitative methods in health, education, and welfare. Health planning models, hospital operations analysis, analysis of educational systems, and welfare planning. Case studies include medical manpower planning, hospital admissions systems, comprehensive health care planning models, assessment of effects of innovation in education, determination of welfare priorities, and resource allocation in welfare problems. Prerequisite: knowledge of calculus and fundamentals of probability and statistics. May be repeated for credit. Admission by permission of instructor. (Fall)

236 **Operations Research in Social Systems** (3)

Quantitative methods in urban development and the administration of justice. Studies of police operations; models for court management; analysis of correctional problems; location of public facilities; scheduling and routing problems; manpower usage; passenger, freight, and vehicular traffic problems; housing problems; models of emergency operations. Prerequisite: knowledge of calculus and fundamentals of probability and statistics. May be repeated for credit. Admission by permission of instructor. (Spring)

237 **Logistics Planning** (3)

Quantitative methods in model building for logistics systems including organization, procurement, transportation, inventory, maintenance, and their

interrelationships. Applications stressed. Prerequisite: ApSc 115 or equivalent. (Spring, even years)

251 Linear Programming (3)

Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems; simplex procedures; duality problems; parametric linear programming and sensitivity analysis, transportation problems. Prerequisite: OR 201 or permission of instructor. (Fall and spring)

252 Nonlinear Programming I (3)

(Formerly Nonlinear Programming)

Basic topics in optimization theory, including first- and second-order optimality criteria, convexity, duality, and algorithms. Methods for solving unconstrained, linearly constrained, and nonlinearly constrained problems. Applications discussed where appropriate. Prerequisite: OR 202, or permission of instructor. (Spring)

253 Integer, Network, and Dynamic Programming (3)

Methods and applications of optimization problems requiring integral solutions. Cutting plane methods, branch and bound methods, group theoretic methods. Dynamic programming. Network programming: shortest route problems, max flow problems. Prerequisite: OR 202, 251; or permission of instructor. (Fall, even years)

261 Theory of Games (3)

Study of mathematical models with applications to the relationships among independent competitive entities (persons or organizations in environment of competition, bargaining, bidding), selection of optimum strategies, minimax concept, connections with linear programming and decision functions, two-person and n-person zero and nonzero sum games. Prerequisite: OR 201 or permission of instructor. (Fall)

271 Forecasting Techniques (3)

Emphasis on a detailed development of the theory and applications of Box-Jenkins techniques (special cases of which are the methods of exponential smoothing and moving averages) for the analysis, forecasting and control of seasonal and non-seasonal time series. An overview of standard regression analysis, especially as it relates to its uses and limitations as a forecasting tool. The techniques discussed are illustrated by considering applications from a broad variety of industrial, engineering, and business situations which the operations research analyst or engineer typically faces. Prerequisite: ApSc 115 or equivalent. (Spring, even years)

273 Digital Systems Simulation (3)

Monte Carlo techniques, random number and random deviate generation. Simulation languages. Operating considerations, including model validation, steady-state, and statistical analyses of simulation output. Applications in inventory, queuing, and production scheduling. Prerequisite: OR 201, 202, or permission of instructor; and knowledge of FORTRAN or BASIC. (Spring, odd years)

275 Introduction to Scheduling (3)

Theory of scheduling with emphasis on industrial applications; assembly line balancing; sequencing and scheduling of jobs in machine shops. Mathematical optimization, heuristic programming, and computer simulation approaches to these problems are examined. Prerequisite: OR 201

and 251; or permission of instructor. (Fall, odd years)

277 **Queuing Theory** (3)

Characterization of queuing systems. Single-channel exponential models. Additional Markovian single- and multiple-channel models, including birth-death processes, finite sources, bulk queues, Erlangian models, and series queues. Models with general arrival and/or service patterns. Model-building, basic solution techniques, and formal theoretical developments are stressed. Prerequisite: Stat 191, OR 201; or permission of the instructor. (Spring)

279 **Inventory Control** (3)

Application of mathematical techniques to decisions regarding when and how much to produce or purchase. Various mathematical models of inventory systems with deterministic and stochastic demands, continuous and periodic review policies, multi-item models with constraints. Demand uncertainty and forecasting in inventory models. Prerequisite: OR 201 or permission of instructor. (Fall)

281 **Reliability Theory I** (3)

Theory of coherent structures, review of statistical procedures relevant to reliability theory, such as estimation techniques, limit theorems, order statistics, and extreme value theory. Probabilistic derivation of failure models. Topics in censored, truncated, and sequential life tests. Bayesian methods in reliability. Testing reliability hypotheses. Topics in accelerated life testing and failure rate estimation. Nonparametric characterization of the failure rate functon, bounds and inequalities useful in reliability theory. Prerequisite: Stat 191 or equivalent, OR 202; or permission of instructor. (Fall)

291 **Problems in Operations Research** (3)

Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. (Fall and spring)

297 **Special Topics in Operations Research** (3)

Selected topics in operations research, as arranged. Prerequisite: permission of instructor. May be repeated for credit. (Fall and spring)

298 **Research** (arr.)

Basic or applied research in operations research. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)

(Fall and spring)

351 **Advanced Topics in Mathematical Programming** (3)

Special topics selected from fractional and geometric programming, branch-and-bound methods, max-min problems, pseudo-Boolean programming, calculus of variations, optimal control, penalty function methods, Lagrangian algorithms, fixed point procedures, sensitivity analysis, and large-scale programming. Prerequisite: OR 252 or permission of instructor. (Spring)

352 **Nonlinear Programming II** (3)

Convex analysis, algorithmic convergence, and rate of convergence. Proofs of optimality conditions. Factorable programming and other problems

with special structures. Matrix methods, sensitivity analysis, and nonconvex optimization. Prerequisite: OR 252 or permission of instructor. (Fall)

361 **Decisions and Value Theory** (3)

(Formerly Games, Decisions, and Value Theory)

Subjective probability and utility theory. Optimal nonsequential and sequential decision processes: Bayes risks and Bayes decisions, randomization and mixed decisions. Optimal stopping. Prerequisite: Stat 191 and OR 261; or permission of instructor. (Spring, odd years)

371 **Advanced Topics in Forecasting** (3)

Continuation of OR 271 designed for those who wish to develop further capability in this area. Topics include a brief review of OR 271, estimation of parameters of Box-Jenkins models, transfer function models for relating two or more time series, models for intervention analysis, and models for feedforward and feedback control schemes. Also, other techniques and concepts useful in forecasting, such as spectral analysis of time series, including cross-spectral analysis and Fourier analysis. Review and discussion of current literature. Prerequisite: OR 271 or equivalent or permission of instructor. (Fall, even years)

377 **Advanced Stochastic Models in Operations Research** (3)

Selected applied probability models, including Brownian motion, renewal theory, denumerable Markov chains, semi-Markov processes, and Markov decision problems. Applications to topics in advanced queuing and inventory theories, including busy periods, waiting times, imbedded Markov chains, and GI/G/1 queues; and conditions for optimality of (s, S) policies, stochastic leadtime problems, state-dependent leadtimes, and multi-echelon problems. Prerequisite: OR 277, 279; or permission of instructor. (Fall, odd years)

381 **Reliability Theory II** (3)

Stochastic characterization of wear, preservation theorems, classes of distributions useful in replacement policies and maintenance models. Importance of components and systems, availability theory. The multivariate characterization of wear. Shock models and wear processes. Stochastic majorization and use of functions decreasing in transposition. Multivariate life table analysis. Review of current literature. Prerequisite: Stat 191 and permission of instructor. (Spring, even years)

391 **Project for Professional Degree** (3)

Limited to students in the Professional degree program. (Fall and spring)

397 **Advanced Topics in Operations Research** (3)

Advanced topics from the literature of operations research for analysis, presentation, and discussion. Reading assignments from the professional journals selected by the instructor and the student. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Required Courses in Engineering Undergraduate Curricula Offered by Columbian College of Arts and Sciences and by the Graduate School of Arts and Sciences

For convenience, descriptions of required courses in undergraduate curricula which are offered by Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences are listed here. See the *Undergraduate and Graduate Bulletin* for elective courses in the humanities and social sciences.

BIOCHEMISTRY

221–22 **General Biochemistry** (3–4)
(Formerly 3 or 4–4 or 5 credits)
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Generally, graduate students *must* register concurrently for Bioc 223, and for Bioc 224. However, graduate students taking Bioc 225–26, ForS 281–82, Micr 241–42, or Phys 223–24 may register for Bioc 221–22 without the laboratory. With specific recommendations by the undergraduate adviser and the Department, undergraduate students may register for Bioc 221–22 without the laboratory. Prerequisite: Chem 152, 154. (Academic year)

BIOLOGICAL SCIENCES

Biology

11–12 **Introductory Biology for Science Majors** (4–4)
Lecture (3 hours), laboratory (3 hours). Biological principles and problems designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $18 a semester. (Academic year)

Zoology

145 **Introduction to Vertebrate Embryology** (4)
Lecture (2 hours), laboratory (4 hours). Origin and early development of the individual, formation of organ systems. Emphasis on frog, chick, and pig, with reference to human embryo. Material fee, $20. (Fall)

148 **Histology** (4)
Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $20. (Fall and spring)

CHEMISTRY

13 **General Chemistry** (4)
For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical

bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry; organic chemistry. Prerequisite: Math 31, Phys 2. Laboratory fee, $28. (Fall)

22 **Introductory Quantitative Analysis** (4)

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28. (Fall and spring)

151–52 **Organic Chemistry** (3–3)

Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 **Organic Chemistry Laboratory** (1–1)

Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $28 a semester. (Academic year)

ENGLISH

*9 **English Composition: Language as Communication** (3)

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure in writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semester hours of credit; the reading course meets an additional three hours a week for a maximum of 10 weeks. Fees: tuition, $315; special fee, $25. (Fall and spring)

*10 **English Composition: Language as Communication** (3)

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and spring)

GEOLOGY

136 **Engineering Geology** (3)

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31, Phys 2 or 4; or permission of instructor. (Spring)

MATHEMATICS

30 **Precalculus** (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra.

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* Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students whose scores and/or writing skill indicate superior competence will be allowed to waive the Engl 10 requirement.

one year of high school geometry, and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring)

31 Calculus of One Variable (3)

Differentiation and integration of algebraic and elementary transcendental functions, with simple applications. Prerequisite: Math 30* or equivalent. (Fall and spring)

32 Calculus of Several Variables (3)

Vectors, determinants, partial derivatives, multiple integrals, infinite series. Prerequisite: Math 31. (Fall and spring)

PHYSICS

3 Foundations of Physics (3)

Lecture (2 hours), recitation (1 hour). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat and electromagnetism, including the classical concepts of energy, momentum, heat, temperature, entropy, electric and magnetic fields, optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6.

14 Introductory Mechanics and Thermal Physics (3)

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18 (Spring)

15 Elements of Electricity and Magnetism (3)

Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's law, Gauss' Law, electric potential, capacitance and dielectrics, electric current and resistance. Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18. (Fall)

16 Introduction to Modern Physics (3)

Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to basic principles of quantum theory. Topics include wave-particle duality, the hydrogen atom, Pauli's exclusion principle, X-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid state physics. Prerequisite: Phys 14, 15, Math 32. Laboratory fee, $15. (Spring)

*Math 30 may be waived as a prerequisite by examination on scheduled dates.

SOCIOLOGY

126 **Urban Sociology** (3)

Place of the city in larger society; growth of the city, problems of urban living, group life, personality, urban housing, city planning, and suburban development. (Fall)

GENERAL INFORMATION

Registration

THE DATES, HOURS, AND PLACE OF REGISTRATION will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

Students cannot register for classes without having received a letter of admission to the University issued by the appropriate admitting office.

No registration is accepted for less than a semester or less than one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which the student is registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration*. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate committee.

ELIGIBILITY FOR REGISTRATION

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student.—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student.—A student previously registered in the University who was not registered for campus courses during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before the student is eligible for registration.

Continuing Student.—The student registered for campus courses in the immediately preceding semester or the Summer Session preceding the fall semester is eligible to register, assuming good standing and enrollment in a continuing program.

REGISTRATION CHANGES AND WITHDRAWALS (see pages 187–189, 194–195)

Fees and Financial Regulations

FEES PAID BY STUDENTS cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution make up the difference.

The following fees and financial regulations were adopted for the 1977–78 academic year. (See page 186 for projected tuition and fee increases for 1978–81.)

Tuition Fees

For undergraduate study:

Full-time program (12 or more hours a semester)	$1,450.00
Part-time program, for each semester hour	107.00
Summer Sessions, for each semester hour	100.00

For graduate study* 107.00

For each semester hour for which the student registers

Doctoral students are required to register for minimum hour-loads,† as follows:

1. Full-time doctoral students must register for a minimum of 12 semester hours a semester until 24 hours of work have been completed beyond the qualifying examination; and a minimum of 4 semester hours a semester thereafter until the satisfactory completion of the final examination.
2. Part-time doctoral students must register for a minimum of 6 semester hours a semester until 24 hours of work have been completed beyond the qualifying examination; and for a minimum of 4 semester hours a semester thereafter until the satisfactory completion of the final examination.

University Center Fee

(Charged all students registered on campus,‡ nonrefundable)

For students registered for 11 or more semester hours on campus: Each semester	50.50
For students registered for less than 11 semester hours in a semester on campus: For each semester hour for which the student registers	4.75
For students maintaining "continuous registration" status: Each semester	4.75

Additional Course Fees

In certain courses additional fees, such as laboratory and material fees, are charged

* Registration in thesis courses (299-300) entitles the student, during the period of registration, to the advice of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished an additional semester will be granted, requiring payment of a "continuous registration" fee (see page 185). If the preparation of the thesis extends beyond the three-semester period, approval for this extension will be required, and the student must repeat the thesis course 300 and pay tuition as for a repeated course, provided the overall time limit for earning the degree is not exceeded.

† No minimum hour-load is required during the summer sessions.

‡ Students in off-campus programs are charged the University Center Fee only when registered for courses on campus.

as indicated in the course description. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. Breakage of apparatus is charged against the individual student. When breakage is in excess of the normal amount provided for in the laboratory fee the individual student will be required to pay such additional charges as are determined by the department concerned.

Graduation Fees

Bachelor's, Master's, Doctor's degrees	$25.00
Fee for binding Master's thesis	10.00
Fee for microfilm service and printing announcement of final examination for the doctoral degree	60.00

Residence Hall Fees (see pages 203–204).

Special Fees and Deposits

Application fee (undergraduate degree candidates) nonrefundable	10.00
Application fee (graduate degree candidates), nonrefundable	25.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	100.00
Admission tests (when required)	6.00–12.00
Late-registration fee, for failure to register within the designated period	15.00
Late-payment fee, for failure to make payments when due (see "Payment of Fees," pages 186–187)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," pages 186–187)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, returned by the bank for insufficient funds, or returned for any other reason	15.00
Continuous registration fee, to maintain "continuous registration" status during any semester of absence from the University or after completion of tuition requirements*—due and payable on the official days of registration	107.00
Engineers' Council fee, charged each student in the School of Engineering and Applied Science for each semester or any part thereof except the summer term	5.00
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
For each waiver examination to qualify for advanced placement and for each special examination	5.00
English test for international students (when required)	10.00
Laboratory checkout fee, for failure to check out of chemistry laboratory by the date deadline set by the instructor†	10.00

* Payment of the continuous registration fee entitles the student who is granted leave of absence to return and continue work toward a degree under the academic requirements which were in force at the time of first registration. The continuous registration fee applies toward neither tuition fee nor residence requirements for the degree. (See footnotes on page 184.)

See page 197 for regulation governing Military Leave.

† A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next regular laboratory period.

Transcript fee, for each transcript of record..... 2.0
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2 each; fee for additional copy..... .5
Replacement of lost or stolen picture identification card..... 2.0

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the services of the Student and Alumni Career Services Office; (2) the use of the University Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *University Hatchet*, the student newspaper; (6) admission to University debates; (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

PROJECTED TUITION AND FEE INCREASES 1978–81

In order that students and their parents may plan more realistically for a total four-year period, tuition increases for the academic years 1978–79, 1979–80, and 1980–81 have been estimated as follows:

Increase by year (full-time undergraduate students):

1978–79	$200.00
1979–80	300.00
1980–81	200.00

Increase by semester hour (graduate and part-time undergraduate students):

1978–79	$5.00
1979–80	8.00
1980–81	7.00

It is not possible to project future economic data with certainty. The increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting him to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before October 26, 1977 (for the fall semester), and March 8, 1978 (for the spring semester). Interest at the rate of eight per cent per annum on the un-

paid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $650 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of eight per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits his right to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

PREPAID AND DEFERRED PAYMENT PLANS FOR PARENTS

Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the Dean of the School. Notification to an instructor is not an acceptable notice (see "Withdrawal," page 195).

Withdrawal

Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, and the Dean.

* Regulations concerning withdrawals and refunds for the Summer Sessions are stated in the *Summer Sessions Schedule of Classes.*

Late Withdrawal

Withdrawal from any course without academic penalty after the twenty-eighth day following the first day of classes may be granted with the approval of the instructor, the student's adviser, the chairman of the department in which the student is enrolled, and the Associate Dean. Requests for late withdrawal must be submitted to the Associate Dean's office on a special form for late withdrawal and accompanied by a drop-add slip. Late withdrawals may be granted only under the following conditions:

1. Withdrawal is necessitated by exceptional circumstances such as certified medical absence or forced absence from class incurred by work-related requirements, and
2. As of the date of the request, the grades in all courses involved are *C* or better for graduate students, and *D* or better for undergraduate students. In all cases, financial regulations governing withdrawal remain in full effect.

Change in Course Status

The status of a course may not be changed from credit to audit or vice-versa after the twenty-eighth day after classes have started for the semester.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:

   Fall Semester

Withdrawal dated on or before September 9, 1977	90 per cent
Withdrawal dated September 12 to September 23, 1977	75 per cent
Withdrawal dated September 26 to October 7, 1977	50 per cent
Withdrawal dated after October 7, 1977	none

   Spring Semester

Withdrawal dated on or before January 20, 1978	90 per cent
Withdrawal dated January 23 to February 3, 1978	75 per cent
Withdrawal dated February 6 to February 17, 1978	50 per cent
Withdrawal dated after February 17, 1978	none

2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference in charges between the original program and the adjusted program continuing in effect.
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. A student who is granted military leave before completing the semester will receive credits for current charges in accordance with the schedule for complete withdrawal from the University (see No. 1, above). Payments made in excess of the nonrefundable balance will be refunded to the student. The nonrefundable balance will be maintained as a deferred credit for use by the student when he returns to the University (see "Military Leave," page 197).
5. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

In no case will tuition be refunded or reduced because of absence from classes.

Payment applies only to the semester for which a registration charge is incurred and will not be credited to another semester (exception: students granted military leave, see page 197).

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid*

FOR UNDERGRADUATE STUDENTS

GEORGE WASHINGTON UNIVERSITY offers a program of financial assistance of two basic types: awards for academic achievement without reference to financial circumstances—honor scholarships; and scholarships, grants, loans, and employment based upon demonstrated financial need.†

Honor Scholarships.—George Washington University honor scholarships of up to $1,000 for the academic year based entirely upon academic achievement and potential without regard to financial need are restricted to incoming freshmen and are extremely limited in number.

Need-based Aid.—The University offers extensive programs of scholarships, grants, loans, and employment based upon demonstrated need. The University participates in the National Direct Student Loan, Basic Educational Opportunity Grant, Supplemental Educational Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid must be filed by February 1 (entering freshmen) or March 1 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.‡ A student must reapply for financial aid each year.

Complete information concerning financial assistance is contained in the pamphlet, "Student Financial Aid," which is available at the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

Scholarships and Grants

Scholarships are awarded for the academic year unless otherwise specified and are credited in equal parts for each semester. Each holder must carry a full schedule of academic work during the period for which the scholarship is awarded.

The following scholarships are limited to students in the School of Engineering and Applied Science. The University offers many others which are open to

* For information concerning financial aid for students from foreign countries, see pages 192–193.
† Applicants should file the Parents' Confidential Statement with the College Scholarship Service, Box 176, Princeton, N.J. 08540.
‡ Summer Sessions students are eligible for consideration only if they were enrolled in this University for at least 8 semester hours in the immediately preceding spring semester or have applied for financial aid for the following fall semester.

engineering students.

Frederick Albert and Alma Hand Britten Scholarships (1959).—Bequest of Alma Hand Britten for scholarship assistance to students entering the School of Engineering and Applied Science who would not otherwise be able to pursue such professional study. Available for undergraduate and graduate study.

American Association of Cost Engineers Scholarship (1977).—Established by American Association of Cost Engineers for scholarship assistance to a full-time student, graduate or undergraduate, majoring in a curriculum which includes courses related to cost engineering.

Henry Harding Carter Scholarship (1896).—Established by Maria M. Carter in memory of her husband to aid a deserving student who is preparing for the civil engineering profession. Available to students working toward the degree of Bachelor of Science (Civil Engineering).

Henry Parsons Erwin Scholarship (1955).—Established by Helen B. Erwin as a memorial to her husband, a former Trustee of the University. A partial scholarship for a student in Engineering and Applied Science.

Louis E. Giles Memorial Scholarships (1966).—Bequest of Susie E. Giles in honor and memory of her husband for scholarships to undergraduate and graduate students in the School of Engineering and Applied Science requiring financial assistance.

The George Hyman Construction Company Scholarships (1974).—Established by the George Hyman Construction Company to aid deserving students preparing for the civil engineering profession. These partial tuition undergraduate scholarships begin in the fall semester and extend for four years, provided the holder maintains a *B* average based upon a full course load leading to a degree in civil engineering and continues to be in financial need.

National Fund for Minority Engineering Students Scholarship (1977).—Scholarship for minority students who require financial assistance and are in good academic standing.

George Washington University Board of Trustees Scholarships.—Full and partial tuition undergraduate scholarships which begin in the fall semester and extend for four successive academic years, provided the holder maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a Bachelor's degree.

FOR GRADUATE STUDENTS

Scholarships, Fellowships, Assistantships

The George Washington University program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. Application for admission to graduate study is a prerequisite for consideration.

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the Dean of the School and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, the application and supporting credentials should be submitted not later than February 1 preceding the period for which the award is made.

Frederick Albert and Alma Hand Britten Scholarships (1959).—See above.

American Association of Cost Engineers Scholarship (1977).—See above.

Paul H. and Margaret M. deMaine Scholarships (1967).—Full and partial

scholarships for graduate students whose research involves the use of computers. Inquiries should be made to the Director of the Center for Academic and Administrative Computing of the University.

Louis E. Giles Memorial Scholarships (1966).—See above.

Phi Delta Gamma Scholarship Endowment Fund (1968).—Established by the Beta Chapter of Phi Delta Gamma, national fraternity for graduate women. For graduate women students.

National Science Foundation Graduate Fellowships.—Fellowships leading to graduate degrees in the mathematical, physical, medical, biological, engineering, and social sciences, and in the history and philosophy of science; providing tuition, fees, and stipends. Open to students who have been admitted to graduate status and who have completed less than one calendar year of graduate study. Applications should be made to the Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

Research Assistantships in Operations Research and Related Fields.—Available to graduates, and to undergraduates on the junior and senior levels, in any school of the University. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program or in programming or in conducting individual research on an approved research project. Stipends range up to $8,500, depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from Director, Institute for Management Science and Engineering, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

Research Assistantships in Engineering Administration.—Available to graduates in any Engineering Administration program. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program. Stipends range up to $8,500 depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from the Chairman, Department of Engineering Administration.

Research Scholar Assistantships, GWU—NASA-Langley Program.—See page 37.

Resident Assistantships.—Available to graduate students and seniors in any field who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes full tuition and a furnished room for the academic year. All positions are part-time, and staff members must enroll as full-time students in degree-granting programs. The application should be completed before March 1. Further information may be obtained from the Office of the Director of Housing.

SPONSORED AWARDS FOR GRADUATE STUDY

Information regarding awards sponsored by foundations, professional and learned societies, industries, and others which may be used in support of graduate study is available at the Graduate Fellowship Information Center, 2025 H St., N.W., for students enrolled at George Washington University. Information is also available on distinguished programs such as the Rhodes, Marshall,

National Science Foundation, Fulbright, Rotary International, and Danforth a
well as many others.

Since deadlines for application vary, qualified students should make inquiries
well in advance of the year of planned graduate study.

LOAN FUNDS

Several loan funds are available to students in the University in accordance
with the qualifications specified by the donors. Two loan programs limited
to students in the School of Engineering and Applied Science are available.
Students should direct inquiries to and file applications with the Office of Stu-
dent Financial Aid. Applications for the National Direct Student Loan should
be filed no later than April 1 for the following academic year. Complete infor-
mation is contained in the pamphlet, "Student Financial Aid," available in the
Office of Student Financial Aid, George Washington University, Washington,
D.C. 20052.

Warren Stickler Memorial Loan Fund (1966).—A fund established by the
Precision Measurements Association as a memorial to Warren Stickler is avail-
able to engineering students.

John Brewster Willis, Jr., Loan Fund in Mechanical Engineering.—Estab-
lished by Mrs. William L. Lane as a memorial to her nephew, John Brewster
Willis, Jr. Available to Mechanical Engineering students (graduate or under-
graduate) who are primarily interested in aeronautics.

Two short-term emergency loan funds are also available at the University.
Information concerning these funds is available from the Office of Student
Financial Aid.

STUDENT EMPLOYMENT

The University participates in the College Work-Study Program. Inquiries
should be addressed to the Office of Student Financial Aid. In addition, the
Student and Alumni Career Services Office maintains a registry of both full-time
and part-time positions available in the Washington area for undergraduate and
graduate students.

After registration, students may apply at the Student and Alumni Career
Services Office, Woodhull House, 2033 G Street, N.W., for interviews and
referrals to positions for which they are qualified.

INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who have com-
pleted one semester of full-time work (15 hours) at this University with a B
average are eligible to apply for the Board of Trustees Scholarships. Scholar-
ships are awarded in the spring for the following academic year. See instructions
for applying for undergraduate financial aid, page 189.

Limited awards for graduate teaching fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English—both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is approximately $6,000. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

Prizes

Norman B. Ames Memorial Award.—Established by many friends of Professor Ames and awarded annually to a graduating senior of the School of Engineering and Applied Science who is nominated by his fellow students as having made significant contributions to the students in the School of Engineering and Applied Science and to the School and University.

Deacon Ames Activities Award.—A plaque awarded annually by Gamma Beta Chapter to the senior in the School of Engineering and Applied Science with the most outstanding record in activities for the entire period of attendance.

Martin Mahler Prize in Materials Testing.—A one-year membership in the American Society for Testing Materials awarded to the upper division or graduate student in engineering who submits the best reports on tests in the materials laboratories course with preference given to prestressed concrete tests.

School of Engineering and Applied Science Distinguished Scholar.—An honor accorded annually by the Faculty of the School of Engineering and Applied Science to the senior who graduates with the highest scholastic standing. The student's name is engraved on a plaque displayed in Tompkins Hall of Engineering.

Regulations

A STUDENT ENROLLED in the School of Engineering and Applied Science is required to conform to the following regulations.

A student who withdraws or is suspended, or is otherwise absent from the University for one semester or more, may re-enter and continue work only under the rules and regulations in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, registration may be canceled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the Faculty) for subsequent registration in the University.

ACADEMIC DISHONESTY

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

CHANGES IN PROGRAM OF STUDY

A student may not make any changes in approved program of study without the approval of the Dean. Requests for change in class registration must be made on a form provided in the School Office.

During the seven days following the first day of classes of a semester, courses may be added to the student's program with the approval of the instructor, the faculty adviser, and the Dean.

Courses may be dropped by undergraduate students without academic penalty only during the 14 days following the first day of classes, with the approval

of the instructor, the student's adviser, and the Dean. Courses may be dropped by graduate students without academic penalty only within the first four weeks of a semester, with the approval of the instructor, the faculty adviser, and the Dean.

WITHDRAWAL

A student who withdraws or is otherwise absent from the University for one semester or more must apply for readmission. If readmitted, the student continues work under the requirements and regulations in force at the time of readmission.

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the Dean of the School. Notification to an instructor is not an acceptable notice.

Withdrawal from a course or from the University, *without academic or financial penalty*, requires the permission of the Dean of the School. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record.

Withdrawal from any course without academic penalty after the fourteenth day following the first day of classes of a semester may be granted by the Dean to undergraduate students only under the following conditions: (1) exceptional circumstances make the request necessary; (2) the request is submitted on the official form for late withdrawal; (3) as of the date of request, the grades in the courses involved are *C* or better. In exceptional circumstances the Dean may authorize withdrawal for graduate students without academic penalty after the first four weeks of a semester. In all cases financial regulations governing withdrawal remain in full effect.

All charges for courses dropped without the approval of the Dean must be met by the student. Reporting the dropping of a course to an instructor does not effect its discontinuance.

CREDIT

Credit is given only after registration for and satisfactory completion of the required work of a course or upon the granting of advanced standing. A student who takes a course as an auditor may not repeat the same course later for credit.

Balance Sheet.—On request the Registrar will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree.

Post-admission Transfer Credit

A student who plans to attend summer school at another institution and apply credit so earned toward graduation from this University must first secure the written approval of the Dean. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has a clear financial record. A fee of $2 is charged

for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript.

CONTINUOUS REGISTRATION

Degree candidates are expected to maintain continuous registration until all degree requirements are satisfied. Students who have completed course registration (including the thesis) maintain continuous registration by paying the "continuous registration" fee (see page 185). By failing to register for one semester or more, the student breaks registration and must be readmitted. The procedure for readmission to the graduate programs is the same as that for undergraduates (see page 18). A "Readmitted Student" is subject to the regulations and requirements in force at the time of readmission.

Students must be registered during the summer if they are taking courses, are taking required examinations, are receiving guidance on theses or dissertations, or are expecting to graduate at the end of the Summer Sessions.

GRADUATION REQUIREMENTS

To be recommended by the faculty for graduation a student must have met the admission requirements of the School; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which he is registered; and be free from all indebtedness to the University. Registration, either for course work or on the "continuous registration" fee basis, is required for the semester or summer session immediately preceding the awarding of the degree.

Application for Graduation.—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (not at formal convocation) dated September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Attendance and Conduct.—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

THE LIBRARY

All students registered in the University have the privilege of using the University Library. Its stacks are open, and all students are welcome to browse at their leisure. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 14 days. A fine of 25 cents is charged for each day a book is overdue. Any book which circulates is subject to recall by the Library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the Library is open, except that they may be

withdrawn for overnight use beginning at 8:30 p.m. A fine of 50 cents is charged for each hour or fraction thereof that a reserve book is overdue. Grades of a student are withheld until the library record is clear.

All students using the University Library are expected to be familiar with its detailed regulations, available at any of the Library's service desks.

MILITARY LEAVE

A student called to active duty may be granted military leave for the period of active duty, upon presentation to the Dean of a copy of military orders and a petition for such leave. The maintenance of "continuous registration" is not required of the student on military leave; however, the student must apply for readmission to the University well in advance of the semester of expected return. Payments for tuition and fees which are not refunded to the student at the time military leave is granted will be maintained as a deferred credit for the student's account and use upon return to the University.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. Afford students access to education records directly related to them;
2. Offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. Receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Personally identifiable information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. Comply with a judicial order or a lawfully issued subpoena to release a student's record, notifying the student of such action.

The University will release the following directory information upon request: address; telephone number; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; and honors received. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

University guidelines on the release of student information may be obtained from the Office of the Registrar.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A "Lost and Found" Office is located on campus in the Safety and Security Office.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violations of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

Consortium of Universities of the Washington Metropolitan Area, Inc.

THE UNIVERSITIES IN WASHINGTON, D.C.—American University, Catholic University of America, *George Washington University*, Georgetown University, and Howard University—are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all the particular courses which best meet their needs.

Participation is limited to campus degree candidates. The following, however, are excluded: students in Canon Law, Dentistry, Medicine, and Theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (as in music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course. A student interested in registering for Reserve Officer Training Corps (ROTC) courses should consult the Registrar at the institution in

which the student is enrolled.

Students interested in taking courses at an institution other than their own should consult the program announcements of the other institutions. Consortium application forms and instructions are available in the Office of the Registrar after the student has obtained registration materials. In order to participate in the Consortium program (1) graduate students must obtain the approval of the adviser and should ascertain from the department of the institution where the course is taught whether or not they are eligible for the course and whether there is a space in the class, *or* (2) undergraduate students must obtain the approval of the adviser and *must* ascertain from the department of the institution where the course is taught whether or not they are eligible for the course and whether there is space in the class. Specific inquiries should be addressed to the Registrar. *Students may not take courses at another institution that are available at their own.* Students register and pay at their own institutions for all Consortium courses.

Center for Academic and Administrative Computing

THE CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other operational supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week, to all qualified faculty, staff, and students.

The Center provides computational facilities and services to academic, research, and administrative users. The Center staff conducts seminars, consults with users, and provides operational assistance as required. The central processing unit is an IBM 370/148 with card-reading capability, on-line disc storage, and tape units, two printers, and a remote entry device for quick turnaround. The operating system is a modified OS/VS1 with most of the commonly used compilers and a large library of programs.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

The Speech and Hearing Clinic

THE SPEECH AND HEARING CLINIC offers diagnostic and remedial work for children and adults with such communication difficulties as stuttering, lisping, cleft-palate speech, and cerebral-palsied speech; and with voice, articulatory, and hearing problems. Diagnostic and remedial work is also available for persons with nonstandard language usage due to such conditions as hearing loss, brain damage, mental retardation, and environmental factors.

Fees.—The fee for an initial evaluation is $35. Fees for additional specialized testing are dependent on the testing involved. The fees for individual

speech or hearing therapy range from $4 to $25 a session. Fees are reduced for full-time students enrolled in the University and for persons receiving group therapy. Fees are payable at the Office of the Cashier.

The Reading Center

THE READING CENTER offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school and college students as well as other adults.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed. Mechanical aids such as the tachistoscope, rate accelerator, and controlled reader are available for increasing speed of comprehension.

Fees.—The fee for individual diagnosis is $125; for individual instruction, $15 a lesson; for semi-individual instruction, $11 a lesson; for instruction in small groups, secondary level, $225 for 15 two-hour lessons. Reading classes (15 two-hour sessions) are offered for adults, $225; for full-time George Washington University students and alumni, $90. Full-time employees may contact the Center regarding special fees. All fees are payable in advance at the Reading Center.

Veterans Education

THE VETERANS COUNSELOR IN Luther Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as veterans, widows, or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans' Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans' Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans' Administration, and which includes other information of general interest.

The Veterans' Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

Alumni Associations

THE GENERAL ALUMNI ASSOCIATION

THE OBJECTIVES OF THIS ASSOCIATION are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have matriculated in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those who are life members of The George Washington University General Alumni Association or the Alumni Association of any school of the University, or are current contributors to the George Washington University Fund.

All alumni are urged to keep the Alumni Office informed of changes of address or occupation and to supply information with regard to their fellow alumni. The Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

THE ENGINEER ALUMNI ASSOCIATION OF THE GEORGE WASHINGTON UNIVERSITY, INC.

The Engineer Alumni Association was organized in 1936 and incorporated in 1963 to coordinate with the General Alumni Association those activities of primary interest to the engineering alumnus. The objectives of the Association are to provide the link between the graduates and faculty of the School, to help promote the general welfare of the School of Engineering and Applied Science and of the University, to foster activities of the engineering organizations recognized by the University, and to advance the engineering profession in general.

In 1966 a board of directors, comprised of 15 elected members of the Association and the Engineers' representatives serving on the Governing Board of the General Alumni Association, was established. The membership of the board of directors was expanded in 1969 to include the Director of Alumni Relations and one representative each from the faculty of the School and the student body. Members of the Association are elected each year, prior to the June meeting, to three-year board memberships as listed below:

Term Expiring 1977
Habib Durrani
Pastor Farinas
Robert J. Keltie
Sarfaraz A. Naqvi
Richard J. Pronk

Term Expiring 1978
Issa Khozeimeh
Eric S. Mendelsohn
Harold Sangester
Dudley J. Schwartz
John A. Sporidas

Term Expiring 1979
Wesley G. Harris
Robert C. Haven
Norris C. Hekimian
Maureen R. Supple
John L. Wolfgang

General Alumni Association Representatives
Douglas L. Jones
John R. Manning
Edward A. Wareham III

Student Representative
Joel Vincent

Regional Director
William H. Holt

Director of Alumni Relations
Elwood A. Smith

Past President
Matthew Flato

Faculty Representative
Galip M. Arkilic

At the June meeting each year the board elects officers for its operation during the upcoming year. The officers for the year 1977–78 are

President.—John L. Wolfgang, B.S.E.E. 1962, M.S.E. 1967; 5600 54th Ave., Riverdale, Md. 20840

Vice President.—Richard J. Pronk, B.S. in Engr. 1958; 12702 Bermuda Lane, Bowie, Md. 20715

Secretary.—Pastor Farinas, M.E.A. 1972; 5 Bethayres Ct., Rockville, Md. 20855

Treasurer.—Eric S. Mendelsohn, B.S.C.E. 1967; 7728 Warbler Lane, Derwood, Md. 20855

STUDENT LIFE

THE OFFICE OF THE VICE PRESIDENT FOR STUDENT AFFAIRS develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Students, Student Activities, Student and Alumni Career Services, and Student Health Service.

Student Services

OFFICE OF THE DEAN OF STUDENTS

The Office of the Dean of Students provides counseling and information for students and assists in program development on campus, particularly in the residence halls. Staff members are well-informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The Dean of Students works with the Adviser to International Students, the Director of the Counseling Center, the Director of the Educational Opportunity Program, the Director of the Student Health Service, and the Director of the Student and Alumni Career Services Office in the implementation of their programs.

Housing

Complete information concerning the University's residence halls is available from the Director of Housing, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing near the University may be obtained at this Office.

Admission to the University does not include a room reservation. The student will receive, with his notification of acceptance, University residence hall information, an application for residence hall space, and a declaration of intent to attend the University. The application for residence hall space must be accompanied by a $100 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room charge. Rooms are leased for the academic year, and lease payment must be made by June 30 for the fall semester.

1977–78 Residence Hall Rates Per Person For Two Semesters*

For Men:

Calhoun Hall

double room	$1,126
triple room	1,074

For Women:

Strong Hall

single room	1,174

*Residence Hall and food service prices subject to change.

double room	$ 1,12
triple room	1,05

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors)—	
double room	1,12
Francis Scott Key Hall (limited to juniors and seniors):	
apartment for two persons	1,20
apartment for three persons	1,200 or 1,15
Mitchell Hall (limited to sophomores, juniors, and seniors)—single room	1,20
Madison Hall	
double room	1,12
triple room	1,05
Thurston Hall	
double room, triple room, large room for four	1,12
suite for six	1,05

Food Service

Resident freshmen and sophomores are required to participate in the food service plan. Freshmen must participate in the seven-day, 19 meals per week plan at the rate of $820* for the academic year. Sophomores may elect either the 20-meal plan or "any 14 meals" per week, for $780* for the academic year. Each plan, plus an additional "any 10 meals" per week plan at $640* for the academic year, is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and the second floor contract dining room in the Cloyd Heck Marvin Center.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Munson Hall Apartments

Munson Hall is a University-owned and operated apartment house containing 15 one-bedroom and 54 efficiency apartments. Graduate and married students are eligible to reside in Munson Hall. Those wishing to apply for an apartment should contact the Housing Office for a waiting list application. All leases are for 12 months.

Educational Opportunity Program

The Educational Opportunity Program is designed to offer a college education primarily to black and other minority students who are graduates of District of Columbia high schools and other qualified District residents. It provides an opportunity for a student to seek a degree in almost any field and at the same time receive academic financial assistance.

* Residence Hall and food service prices subject to change.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board; the departments of drama, dance, and music; and other student and faculty organizations.

The Center Governing Board, representative of all segments of the University community, plays an important role in the day-to-day functioning of the Center. This Board works closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located at 935 22nd St., N.W. (in the H.B. Burns Memorial Building).

Physicians and physician assistants are available by appointment from 9 a.m. to 4:45 p.m., Monday through Friday. In addition, physician assistants are available for primary care to walk-in patients Monday through Friday from 5 to 5:45 p.m., on Saturday from 9 a.m. to 12 noon, and on Sunday from 10 a.m. to noon.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students who so desire may engage physicians and nurses of their own choice, but the student will be responsible for all the fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, X-ray work, laboratories, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The Student Health Service Office has arranged for and endorsed group health and accident insurance, on an elective basis, for those who do not have other coverage. Interested students should consult the Student Health Service Office.

COUNSELING CENTER

The Counseling Center works to enable students to overcome obstacles which hamper learning. The Center's services are offered to students and staff, and include (1) resolution of the individual's educational, vocational, or personal conflicts through short-term individual or group counseling, vocational testing, or study skills remediation; (2) training of graduate students, resident assistants,

and paraprofessionals; (3) consulting on mental health topics; and (4) development of new methods and programs to aid student growth, such as counseling through written communication, videotaped counselor skills training, and interpersonal skills workshops.

The Center administers the Miller Analogies Test, admissions testing, and special assessments for business and industry. Through its Office of Community Services, the Counseling Center also provides vocational counseling and educational programs to the greater Washington community.

Students may request a cost-free interview from 9 a.m. to 4:30 p.m., Monday through Thursday, and 1–4:30 p.m. on Fridays. If the student decides to continue the services offered, a fee of $5 per appointment will be charged for short-term treatment. If a test battery is called for, an additional $12 materials fee will be charged. However, if financial need is a factor, fee adjustments can be made.

The Counseling Center is located at 718 21st St., N.W.

INTERNATIONAL HOUSE

Located in the International House at 2129 G St., N.W., the Adviser to International Students provides advising and counseling in matters of personal and academic concern and visa regulations. This office is also a consultation, information, and resource center for the University's international population.

The International Student Society, which seeks to promote international friendship and understanding, is also located in International House. The organization welcomes as members students from all countries, including the United States.

STUDENT AND ALUMNI CAREER SERVICES OFFICE

The Career Services Office provides career guidance and placement to GW students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills, a full library of literature on occupatons and employers, and current information on government employment, including testing dates and application forms. Seniors and alumni may also use the office to establish credential files for application to graduate schools and for employment. The office is open from 9 a.m. to 5 p.m. Monday through Friday, with evening hours scheduled during each semester. It is located at Woodhull House, 2033 G St., N.W.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Catholic, Jewish, and Protestant bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling.

Religious services in various traditions are provided regularly for the University community as announced.

DAVIS-HODGKINS HOUSE

The Davis-Hodgkins House is the student center of the School of Engineering and Applied Science, providing lounges, reading rooms, and student organization offices. The House provides convenient, comfortable facilities for the exchange of ideas and good fellowship.

Student Activities

The offices of the Vice President for Student Affairs, the Dean of Students, the Director of the Cloyd Heck Marvin Center, and the Director of Student Activities are responsible for all co-curricular phases of student life.

STUDENT ACTIVITIES OFFICE

The Student Activities Office assists individual students and organizations in program development, campus leadership training, and participation in special projects, both within the University community and the community at large. The office serves as a clearinghouse for activities information, registers and advises student organizations, and informs the University community of activities and programs through a variety of weekly, monthly and annual publications. The Student Activities Office is also responsible for coordinating the orientation program for new students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

UNIVERSITY COMMITTEES AND ORGANIZATIONS

Student involvement is a motivating force in the governance of the University through the committee structure. This involvement has helped develop policies and programs beneficial to the student population and to the total University community. The numerous committees on which students may serve are described in the *Student Handbook*, which is available in the Student Activities Office.

Student Government

The George Washington University Student Association (GWUSA) is comprised of all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students to the University. Students who have completed at least 12 semester hours and are in good academic standing are eligible to participate in student government. Further information can be obtained from the Student Activities Office.

THE ENGINEERS' COUNCIL

The Engineers' Council is the student governing body for the School of Engineering and Applied Science, composed of elected representatives from each level class and from the graduate student body, from each student organization in the School, and the House Manager of the Davis-Hodgkins House. The purpose of the Council is to provide liaison between the student body of the School and the Faculty, Administration, and Student Government of the University in all matters affecting the general interests and welfare of the student body, the School, or the University. The Council is maintained financially by the Engineers' Council fee paid by each student in the School, and sponsors the Engineers' Mixers and the Engineers' Ball. Council meetings are open to all students in the School.

STUDENT ORGANIZATIONS

Students are encouraged to become involved with existing student organizations or to initiate their own. The *Student Handbook*, available in the Student Activities Office, lists approximately 150 organizations under the following categories: Academic; Professional; Honorary; International; Cultural; Political Interest; Service; Special Interest; Sports, Hobbies and Recreation; Religious and Meditative; and Social Fraternities and Sororities. More complete information about these organizations can be obtained through the Student Activities Office.

The following is a representative list of organizations active at the University during 1976–77 of particular interest to students in the School of Engineering and Applied Science. More complete information on these and other organizations is available at the Student Activities Office.

Honor Societies

Sigma Xi.—A national scientific honor society, the purpose of which is to encourage original investigation in science, pure and applied. Outstanding graduate students in the sciences are eligible for full membership, and undergraduates who have shown marked ability in research may be elected to associate membership.

Delta Sigma Rho-Tau Kappa Alpha.—A national forensic society.

Mortar Board.—A national society for juniors and seniors, stressing leadership, scholarship, and service.

Omicron Delta Kappa.—A national society emphasizing leadership in extracurricular activities.

Phi Eta Sigma.—A national society established to encourage and reward high scholarship and attainment, membership in which is limited to those freshmen who attain a scholastic average of at least 3.50 or the equivalent.

Sigma Tau.—A national engineering honorary fraternity, the purpose of which is to recognize scholarship and professional attainment.

Tau Beta Pi.—A national engineering honorary fraternity, the purpose of which is to recognize distinguished scholarship and exemplary character.

International and Cultural Exchange Organizations

East Asian Society, Friends of Canada, International Students' Society, Latin American Association, Libyan Student Organization, Organization of Arab Students, Polish American Youth Club, Students' Cultural Association of India, World Affairs Society.

Performing Arts

GWU Dance Production Groups; Student Productions; University Chamber Choir, Chorus, Orchestra; University Program Board; University Theater. A variety of programs is presented by these groups throughout the academic year.

Political Interest Organizations

GW Ripon Society, GW College Young Republicans, GW Young Democrats, Young Americans for Freedom, Young Socialist Alliance.

Professional Organizations

American Society of Civil Engineers (Student Chapter).
American Society of Mechanical Engineers (Student Chapter).
Institute of Electrical and Electronic Engineers (Student Chapter).
Theta Tau (Gamma Beta Chapter).—A national professional (engineering) fraternity. Membership by invitation to outstanding students who have completed successfully at least the first year in the School of Engineering and Applied Science.

Publications and Communications

The Cherry Tree (yearbook), *G.W. Forum* (student-faculty journal), *Potomac Review* (publication of Consortium graduate students), *The Rock Creek* (literary magazine), *Student Handbook*, *This Month* (listing of major cultural events in the Washington area), *Campus Calendar* (biweekly listing of scheduled events), *The University Hatchet* (semi-weekly newspaper), WRGW (University radio station), 676-NEWS (recorded telephone message of daily University activities).

Religious and Meditative Organizations

Baptist Student Union, B'nai B'rith Hillel Foundation, Christian Science Organization, Eastern Orthodox Fellowship, Eckankar Campus Society, Interfaith Christian Fellowship, Lutheran Student Association, Newman Foundation, Psychegenics Club, Religious Society of Friends, Student International Meditation Society, Unitarian-Universalist Club, United Christian Fellowship, Wesley Foundation.

Service Organizations

Circle K, Ecology Action, GW Medical Aid, Project Share, St. Elizabeth's Hospital Project, SERVE, Student Housing Project, Student Volunteer Action Council.

Social Fraternities

Delta Tau Delta, Kappa Sigma, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Tau Kappa Epsilon. The Interfraternity Forum coordinates the interest and concerns of some of the fraternities on campus.

Social Sororities

Delta Gamma, Delta Sigma Theta, Kappa Kappa Gamma, Phi Sigma Sigma. A Panhellenic Council includes representatives of sorority chapters at the University.

Special Interest and Advocate Groups

Black Peoples' Union, Jewish Activist Front, Legal Aid Bureau, Peoples' Union, D.C. Public Interest Research Group (GW Chapter), Student Recruitment Committee.

Sports, Hobbies, Recreational Organizations

Amateur Radio Club, Cheerleaders, Collegiate Bowling Club, Folkdance Club, Hockey Club, Military Collectors, Philubious Eggworte (music).

ATHLETICS AND INTRAMURAL SPORTS

The University is a member of the National Collegiate Athletic Association, the Eastern College Athletic Conference, the Association for Intercollegiate Athletics for Women, and the Eastern Association of Intercollegiate Athletics for Women. Its teams participate against major universities throughout the Midwest and Eastern Seaboard. The intercollegiate programs for men and women offer such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, cross country, swimming and diving, squash, badminton, and volleyball.

The University offers a broad program of intramural sports activities for both men and women through the Department of Human Kinetics and Leisure Studies.

MAJOR PROGRAM EVENTS

Art Exhibits.—The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Lounge and in the art gallery of the Cloyd Heck Marvin Center. With the cooperation of the Curator of Art, an annual student art exhibit is presented.

Concert Series.—The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

Dance.—The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance productions.

International Programs.—The International Students' Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on

international topics.

Orchestra and Chorus Concert Series.—The University Orchestra and Chorus are two facets of the lively arts available to students either as credit courses or as extracurricular activities. The Chorus presents major performances to the University community three or four times a year, including regular winter and spring concerts. The University Orchestra presents several performances annually.

Program Board Series.—In addition to weekly films and special events, the University Program Board regularly sponsors concerts and lectures each semester at which nationally known personalities appear.

Recreation Program.—The new Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use. The University Recreation Association and the Department of Human Kinetics and Leisure Studies arrange a wide variety of sports and recreational activities and special events for all students.

Theater.—The University Theater produces four or five major plays and musicals during the year on the new proscenium/thrust stage in the Dorothy Betts Marvin Theatre or in Lisner Auditorium. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students have the opportunity to participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.

THE UNIVERSITY

History and Organization

THE GEORGE WASHINGTON UNIVERSITY had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington whose name it bears is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets and extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period

the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area is not without its reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street; the first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Nineteenth and Eye Streets, and Washington had selected Twenty-third and E Streets as the site of the National University he hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education, Government and Business Administration, and Public and International Affairs; the College of General Studies; the Division of University Students; the Division of Experimental Programs; and the Summer Sessions.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an *ex officio* member.

The University Libraries

The Library collections of the University are housed in the University Library (the general library of the University) and in the libraries of the Institute for Sino-Soviet Studies, the National Law Center, and the School of Medicine and Health Sciences.

These collections contain approximately 700,000 volumes, to which are added some 40,000 volumes a year. Endowments, supplementing the University appropriation, provide books in the fields of American civilization, American literature, foreign service, history, public finance, and the social sciences, and gifts from many sources have enriched the collections. The Libraries currently receive 7,500 periodicals.

Information concerning the use of the Libraries may be obtained at the Library service desks.

The Library is administered for the curricular, reference, and recreational needs and interests of the students. Instruction in the use of the library is given by the reference librarians upon request. The Libraries endeavor to assist students and all members of the University to use the rich library resources of Washington and the unusual opportunities they offer for extensive research. Interlibrary loan arrangements are maintained with other libraries in the city and throughout the United States.

The student has access to the Library of Congress, the Public Library of the District of Columbia and its branches, and many of the other great special collections of the government departments. Graduate students at George Washington University may, upon application, be issued a Consortium library card which permits direct borrowing from the libraries of the other Consortium institutions.

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B.S. in M.E. 1920, George Washington University

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C.E. 1929, D.Sc. 1930, Prague Institute of Technology; M.S. 1930, Prague University

Kenneth Johnson, *Professor Emeritus of Engineering Administration*
B.A. 1931, Indiana State University; Ph.D. 1937, Purdue University

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B.S. 1930, C.E. 1932, City University of New York, City College; M.S. 1936, Ph.D. 1940, New York University

Carl Hugo Walther, *Professor Emeritus of Engineering and Applied Scienc*
B.E. 1931, M.C.E. 1933, Johns Hopkins University; Ph.D. 1967, University of Maryland

ACTIVE

Abd-elfattah Abd-alla, *Associate Professor of Engineering and Applied Science*
B.S. 1960, Ain Shams University, Egypt; M.S. 1963, Alexandria University; Ph.D. 1969, University of Maryland

Achilles Grammenos Adamantiades, *Associate Professorial Lecturer in Engineering*
Ph.D. 1966, Massachusetts Institute of Technology

Julian Gordon Adler, *Associate Professorial Lecturer in Engineering*
B.S.E. 1960, University of Michigan

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B.M.E. 1946, Cornell University; M.S. 1947, Illinois Institute of Technology; Ph.D. 1954, Northwestern University

Ernest Stokes Armstrong, *Assistant Professorial Lecturer in Engineering*
B.S. 1959, M.S. 1961, Clemson University; Ph.D. 1967, North Carolina State University at Raleigh

Donald Stuart Arnstein, *Associate Professorial Lecturer in Engineering*
B.E.E. 1962, City University of New York, City College; M.S. in E.E. 1963, Massachusetts Institute of Technology; Ph.D. 1972, University of California, Los Angeles

George Axelby, *Assistant Professorial Lecturer in Engineering*
B.S. 1950, University of Connecticut; M.S. 1951, Yale University

Abdul Aziz, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1952, Dacca University, Bangladesh; M.S. in M.E. 1954, Michigan State University; Ph.D. 1972, University of Maryland

Gokalp Baboglu, *Assistant Professorial Lecturer in Engineering*
B.A. 1974, M.S. 1976, George Washington University

Robert Fulton Baker, *Professorial Lecturer in Engineering*
B.C.E. 1940, Ohio State University; M.S. in C.E. 1942, Purdue University

Stephen John Balut, *Associate Professorial Lecturer in Engineering*
B.A. 1960, King's College; M.S. 1973, Ph.D. 1973, Naval Postgraduate School

Michael Benedict Barker, *Associate Professorial Lecturer in Engineering*
B.Arch, 1963, M.C.P. 1965, University of California, Berkeley

Bruce Richard Barkstrom, *Assistant Research Professor of Applied Science*
B.S. 1966, University of Illinois; M.S. 1971, Ph.D. 1972, Northwestern University

Richard Walker Barnwell, *Associate Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, Auburn University; Ph.D. 1968, Virginia Polytechnic Institute and State University

Zeev Barzily, *Assistant Research Professor of Operations Research*
B.S. 1968, M.S. 1971, D.Sc. 1974, Technion, Israel Institute of Technology

Nicholas Basdekas, *Associate Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, C.E. 1958, Columbia University; Ph.D. 1969, Catholic University of America

Ivan Earl Beckwith, *Assistant Professorial Lecturer in Engineering*
B.S. 1948, University of Iowa

John Amos Belding, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1965, Ph.D. 1969, University of Alabama

Gerald Bennington, *Associate Professorial Lecturer in Engineering*
B.S. 1963, University of Michigan; M.S. 1964, Ph.D. 1969, Johns Hopkins University

John William Benoit, *Associate Professorial Lecturer in Engineering*
B.S. 1952, University of Washington; M.S. 1954, North Carolina State University at Raleigh; Ph.D. 1961, Princeton University

Peter Derek Bergstrom, *Assistant Professorial Lecturer in Engineering*
B.E.E. 1960, M.S. in E.E. 1963, Ph.D in E.E. 1973, Georgia Institute of Technology

Howard Emery Bethel, *Associate Professorial Lecturer in Engineering*
B.S. in Ae.E. 1961, M.S. 1963, Ph.D. 1966, Purdue University

John Joseph Bisaga, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1955, M.S. in E.E. 1963, Drexel University

William Thomas Bisignani, *Associate Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, Ph.D. 1972, Rutgers—The State University (New Brunswick)

Lewis Blakey, *Associate Professorial Lecturer in Engineering*
B.S. 1954, University of Notre Dame; M.S. 1962, George Washington University

Jerry Wayne Blankenship, *Assistant Professorial Lecturer in Engineering*
M.S. 1970, Western Kentucky University; Ph.D. 1974, Northwestern University

Alvin Michael Bloom, *Associate Research Professor of Engineering*
B.S. 1962, M.S. 1964, Ph.D. 1967, University of Texas at Austin

Peter Bock, *Special Lecturer in Engineering*
B.A. 1962, Ripon College; M.S. 1964, Purdue University

William James Boettinger, *Assistant Professorial Lecturer in Engineering*
B.E.S. 1968, Ph.D. 1972, Johns Hopkins University

Roland Lee Bowles, *Assistant Professorial Lecturer in Engineering*
B.S. 1959, Randolph-Macon College; M.S. 1961, Ph.D. 1971, University of Virginia

Daniel Philip Boyd, *Professorial Lecturer in Engineering*
B.S. in Ch.E. 1963, M.S. 1965, Ph D. 1968, University of Maryland

Edward Howard Braun, *Associate Professor of Engineering and Applied Science*
B.A. 1948, M.A. 1950, Columbia University

Richard Still Brice, *Associate Research Professor of Engineering*
B.S. 1959, East Texas State University; M.S. 1968, North Texas State University; Ph.D. 197
University of Texas at Austin

Barton Brooke Bright, *Professorial Lecturer in Engineering*
B.A. 1932, American University

Joseph Bertram Bronder, *Assistant Professorial Lecturer in Engineering*
B.S. 1955, University of Dayton; M.A. 1957, Washington University; Ph.D. 1965, University o
Arizona

Ronald Max Brown, *Associate Professorial Lecturer in Engineering*
B.S. 1958, M.S. 1960, M.A. 1964, Ph.D. 1970, Indiana University at Bloomington

Pierpont Blair Buck, *Associate Professorial Lecturer in Engineering*
B.A. 1943, Yale University; Ph.D. 1949, University of Virginia

August Llewellyn Burgett, *Associate Professorial Lecturer in Engineering*
B.M.E. 1962, M.S.E. 1963, University of Florida; Ph.D. 1968, University of Michigan

Ali Bulent Cambel, *Professor of Engineering and Applied Science*
B.S. 1942, Robert College, Turkey; M.S. 1946, California Institute of Technology; Ph.D.
1950, University of Iowa

John Paul Campbell, *Research Professor of Engineering*
B.S. 1939, Auburn University

James Edward Carter, *Assistant Professorial Lecturer in Engineering*
B.S. 1966, Ph.D. 1972, Virginia Polytechnic Institute and State University; M.S. 1968,
Massachusetts Institute of Technology

William Harold Carter, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1962, M.S. in E.E. 1963, Ph.D. 1966, University of Texas at Austin

Brian Leonard Clarkson, *Adjunct Professor of Engineering and Applied Science*
B.S. 1951, Ph.D. 1953, University of Leeds

George Martin Coburn, *Professorial Lecturer in Law*
B.A. 1947, LL.B. 1949, Harvard University

Paul LeRoy Coe, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1966, Hofstra University; M.S. 1967, Ph.D. 1972, New York University

Byron Cosby, Jr., *Professorial Lecturer in Engineering*
B.S. 1930, Northeast Missouri State College; M.A. 1931, University of Missouri-Columbia
Ph.D. 1934, University of Chicago

Paul Arthur Crafton, *Professor of Engineering Administration*
B.M.E. 1944, City University of New York, City College; M.S. 1950, Ph.D. 1956, University
of Maryland

Milton Orlo Critchfield, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1965, Pennsylvania State University; Ph.D. 1971, University of Illinois

William Fay Croswell, *Professorial Lecturer in Engineering*
B.S. 1952, Virginia Military Institute; M.S. 1954, Air Force Institute of Technology

Michael Charles Cullingford, *Associate Professorial Lecturer in Engineering*
B.Sc. 1961, University of Durham, U.K.; M.Sc. 1966, King's College, U.K.; Ph.D. 1975, North Carolina State University

Anthony Leo D'Ambrosio, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1963, University of Rhode Island; M.E.A. 1972, George Washington University

Allen Das, *Associate Professorial Lecturer in Engineering*
B.S. 1945, M.S. 1947, Ph.D. 1962, University of London

Richard H. Deane, *Associate Professorial Lecturer in Engineering*
B.S. 1966, M.S. 1968, Mississippi State University; Ph.D. 1972, Purdue University

Robert Dillon, *Professorial Lecturer in Engineering*
B.A. 1949, University of Washington; M.A. in Arch. 1952, University of Florida

Louis Divone, *Professorial Lecturer in Engineering*
B.Ae.E. 1955, Polytechnic Institute of Brooklyn; M.S. 1956, Massachusetts Institute of Technology

Philip Donely, *Professorial Lecturer in Engineering*
B.S. 1931, Massachusetts Institute of Technology

Roger Doyon, *Assistant Professorial Lecturer in Engineering*
B.S. 1957, University of New Hampshire; M.E.A. 1964, George Washington University

John Edward Duberg, *Adjunct Professor of Engineering*
B.S. 1938, Manhattan College; M.S. 1940, Virginia Polytechnic Institute and State University; Ph.D. 1948, University of Illinois at Urbana-Champaign

Charles Earl Dunham, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, Rochester Institute of Technology; M.S. in E.E. 1966, Ph.D. 1972, Syracuse University

Jules Berthold Du Peza, *Professorial Lecturer in Engineering*
B.S. 1949, U.S. Coast Guard Academy; M.S. 1964, Naval Postgraduate School

John Eftis, *Professor of Engineering and Applied Science*
B.C.E. 1952, City University of New York, City College; M.S. in C.E. 1958, Columbia University; D.Sc. 1967, George Washington University

Marvin Eisenberg, *Professor of Engineering and Applied Science*
B.S. in E.E. 1953, University of Miami; M.S. in Engr. 1954, Ph.D. 1961, University of Florida

Donald Ellison, *Associate Professorial Lecturer in Engineering*
B.S. 1948, Tri-State College; M.P.A. 1951, Cornell University

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B.S. 1963, St. Vincent College; B.S. in E.E. 1964, M.S. in E.E. 1965, Ph.D. 1966, Carnegie-Mellon University

Wayne Douglas Erickson, *Associate Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, Michigan State University; M.S. 1958, D.Sc. 1962, Massachusetts Institute of Technology

Donald Michael Esterling, *Associate Research Professor of Engineering*
B.S. 1964, University of Notre Dame; M.A. 1966, Ph.D. 1968, Brandeis University

Joel Ettinger, *Associate Professorial Lecturer in Engineering*
B.C.E. 1967, City University of New York, City College; M.S. 1969, Northwestern University

James Edward Falk, *Professor of Operations Research*
B.E.E. 1960, University of Detroit; M.S. 1961, Ph.D. 1965, University of Michigan

Fereidoun Farassat, *Assistant Research Professor of Applied Science*
B.E. 1967, American University of Beirut; M.S. 1970, Syracuse University; Ph.D. 1973, Cornell University

James Elmer Feir, *Professor of Civil Engineering; Associate Dean of the School of Engineering and Applied Science*
B.S. 1950, University of Alberta; M.S. 1955, University of London; Ph.D. 1966, University of Cambridge

David Feit, *Associate Professorial Lecturer in Engineering*
B.A. 1958, B.S. 1959, M.S. 1961, Eng.Sc.D. 1964, Columbia University

Charles Feldman, *Adjunct Professor of Engineering*
B.A. 1944, M.A. 1949, Johns Hopkins University; Ph.D. 1952, University of Paris

Michael Bliss Feldman, *Assistant Professor of Engineering and Applied Science*
B.S.E. 1966, Princeton University; M.S.E. 1970, Ph.D. 1973, University of Pennsylvania

Anthony Vincent Fiacco, *Professor of Operations Research*
B.A. 1950, Union College, New York; Ph.D. 1967, Northwestern University

Stanley Melvin Finger, *Assistant Professorial Lecturer in Engineering*
B.A. 1969, Pratt Institute; M.S. 1972, Ph.D. 1975, University of Maryland

John Bruce Fisher, *Associate Professorial Lecturer in Engineering*
B.S. 1950, St. Lawrence University

Ronald Jeffry Fisher, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1958, Bucknell University; M.E. 1959, University of California, Berkeley

Joseph Foa, *Professor of Engineering and Applied Science*
Dr.Ing. (M.E.) 1931, Polytechnic Institute of Torino; Dr.Ing. (A.E.) 1933, University of Rom

James David Foley, *Associate Professor of Engineering and Applied Scienc*
B.S. 1964, Lehigh University; M.S. 1965, Ph.D. 1969, University of Michigan

Charles William Fotis, *Professorial Lecturer in Engineering*
B.A. 1937, M.A. 1939, Tufts University; Ph.D. 1959, American University

Raymond Richard Fox, *Professor of Engineering and Applied Science*
B.S. in C.E. 1949, M.S. in C.E. 1952, University of Washington

Robert William Fralich, *Associate Professorial Lecturer in Engineering*
B.Ae.E. 1947, University of Cincinnati; M.Ae.E. 1952, University of Virginia; Ph.D. 1963, Virginia Polytechnic Institute and State University

Gabriel Frenkel, *Associate Professorial Lecturer in Engineering*
B.S. 1956, The Cooper Union; M.S. 1960, City University of New York, City College; Ph.D. 1972, George Washington University

Clifford Lynn Fricke, *Associate Professorial Lecturer in Engineering*
B.S. 1947, University of Nebraska; M.S. 1956, University of Virginia; Ph.D. 1967, Virginia Polytechnic Institute and State University

Arthur D. Friedman, *Professor of Engineering and Applied Science*
B.A. 1961, B.S. in E.E. 1962, M.S. in E.E. 1963, Ph.D. 1965, Columbia University

Fred Frishman, *Associate Professorial Lecturer in Engineering*
B.B.A. 1947, City University of New York, City College; B.A. 1956, M.A. 1957, Ph.D. 1[illegible] George Washington University

Robert Earle Fulton, *Professorial Lecturer in Engineering*
B.S. 1953, Auburn University; M.S. 1958, Ph.D. 1960, University of Illinois at Urbana-Champaign

Michael Paul Gaus, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1956, Ph.D. 1959, University of Illinois at Urbana–Champaign

Charles Matthew Gilmore, *Associate Professor of Engineering and Applied Science*
B.S. 1963, M.S. 1964, Pennsylvania State University; Ph.D. 1971, University of Maryland

Ernest Glynn, *Associate Professorial Lecturer in Engineering*
B.S. 1956, University of Maryland

Walter Anthony Goetz, *Assistant Professorial Lecturer in Engineering*
B.S. in M.E. 1960, Michigan State University; M.E.A. 1974, George Washington University

Jeffrey Archibald Gorman, *Assistant Professorial Lecturer in Engineering*
B.C.E. 1958, Cornell University; M.S. 1966, Ph.D. 1968, California Institute of Technology

Robert Goulard, *Professor of Engineering and Applied Science*
Ae.E. 1949, Ecole Nationale Superieure de l'Aeronautique; Ph.D. 1957, Purdue University

Donald Gross, *Professor of Operations Research*
B.S. 1956, Carnegie-Mellon University; M.S. 1959, Ph.D. 1962, Cornell University

Jatinder Gupta, *Professorial Lecturer in Engineering*
B.E. 1963, Delhi University; M.Tech. 1967, Indian Institute of Technology; Ph.D. 1969, Texas Tech University

Irving Haber, *Associate Professorial Lecturer in Engineering*
B.E.E. 1961, The Cooper Union; M.S. 1965, Ph.D. 1969, Polytechnic Institute of Brooklyn

Andrew Lyon Haines, *Assistant Professorial Lecturer in Engineering*
B.A. 1964, Princeton University; M.A.T. 1965, Harvard University; M.S. 1968, Stanford University; D.Sc. 1973, George Washington University

John Frederick Halldane, *Professorial Lecturer in Engineering*
B.S. 1959, B.Arch. 1961, University of New Zealand; Ph.D. 1968, University of Auckland

Barry Wellesley Hannah, *Adjunct Associate Professor of Engineering*
B.S. 1963, M.S. 1965, Ph.D. 1973, University of Cincinnati

Jay Charles Hardin, *Assistant Professorial Lecturer in Engineering*
B.S. 1964, M.A. 1965, Ph.D. 1969, Purdue University

Forest Klaire Harris, *Adjunct Professor of Engineering*
B.A. 1921, M.S. 1923, University of Oklahoma; Ph.D. 1932, Johns Hopkins University

John Hebrank, *Assistant Professorial Lecturer in Engineering*
B.S. 1970, Ph.D. 1974, Duke University

Hermann Josef Helgert, *Associate Professor of Engineering and Applied Science*
B.S. 1962, M.S. 1964, Ph.D. 1966, State University of New York at Buffalo

Robert Bernard Heller, *Professor of Engineering and Applied Science*
B.S. 1946, M.S. 1948, Ph.D. 1951, St. Louis University

Lloyd George Herman, *Professorial Lecturer in Engineering*
B.S.A. 1934, Ontario Agricultural College; Ph.D. 1948, McGill University

Guenther Hintze, *Professorial Lecturer in Engineering*
B.S. 1927, M.S. 1929, Technological College, Breslau, Germany; Ph.D.(Hon.) 1962, New Mexico State University

Lance J. Hoffman, *Associate Professor of Engineering and Applied Science*
B.S. 1964, Carnegie-Mellon University; M.S. 1967, Ph.D. 1970, Stanford University

John Ellis Hogge, *Assistant Professorial Lecturer in Engineering*
B.S. 1960, Randolph-Macon College; M.S. 1968, College of William and Mary

Richard Frank Hoglund, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, Ph.D. 1960, Northwestern University

Lynn Hopewell, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1961, Virginia Polytechnic Institute and State University; M.B.A. 1968, Harvard University

Barry Martin Horowitz, *Associate Professorial Lecturer in Engineering*
B.E.E. 1965, City University of New York, City College; M.S. 1967, Ph.D. 1969, New York University

Joel Lawrence Horowitz, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Stanford University; Ph.D. 1967, Cornell University

Alexander Hoshovsky, *Associate Professorial Lecturer in Engineering*
B.A. 1952, Saint Mary's University; M.S. 1963, George Washington University; Ph.D. 1973, American University

Casimir Joseph Jachimowski, *Associate Professorial Lecturer in Engineering*
B.S. 1960, DePaul University; Ph.D. 1964, Michigan State University

Douglas Linwood Jones, *Associate Professor of Engineering*
B.M.E. 1963, M.S. in Engr. 1965, D.Sc. 1970, George Washington University

Walter Kurt Kahn, *Professor of Engineering and Applied Science*
B.E.E. 1951, The Cooper Union; M.E.E. 1954, D.E.E. 1960, Polytechnic Institute of Brooklyn

Robert Kwei-Chuan Kao, *Visiting Assistant Research Professor of Engineering*
B.S. 1962, National Taiwan University; M.E. 1966, University of South Carolina; Ph.D. 1970, Catholic University of America

J.V. Richard Kaufman, *Research Professor of Engineering and Applied Science*
B.S. 1940, Dickinson College; Ph.D. 1944, Massachusetts Institute of Technology

Roger Emanuel Kaufman, *Associate Professor of Engineering*
B.S. 1962, Tufts University; M.F.A. 1965, Yale University; M.E. 1968, Ph.D. 1969, Rensselaer Polytechnic Institute

John Kaye, *Professor of Engineering and Applied Science*
B.S. in M.E. 1939, M.S. in M.E. 1948, California Institute of Technology

Azer Kehnemui, *Assistant Professorial Lecturer in Engineering*
B.S. 1962, Robert College, Turkey; M.S. 1963, University of Illinois; D.Sc. 1976, George Washington University

Ram Khatri, *Assistant Professorial Lecturer in Engineering*
B.S. 1952, Agra University, India; B.E. 1956, University of Saugar, India; M.S. 1961, Lehigh University; Ph.D. 1971, University of Maryland

Khalilollah Khozeimeh, *Assistant Research Professor of Engineering and Applied Science*
B.C.E. 1965, M.S. 1967, D.Sc. 1974, George Washington University

Ali Muhlis Kiper, *Professor of Engineering*
M.S. in M.E. 1950, Technical University of Istanbul; M.S. in M.E. 1954, Ph.D. 1956, Purdue University

Cecil Eugene Kirby, *Assistant Professorial Lecturer in Engineering*
B.S. 1955, Clemson University; M.S. 1963, Ph.D. 1969, University of South Carolina

Joseph Kirshner, *Professorial Lecturer in Engineering*
B.S. 1947, University of Delaware; M.S. 1952, University of Maryland

Joseph Alexander Knight, *Associate Professorial Lecturer in Engineering*
B.S.(E.E.) 1963, Virginia Polytechnic Institute and State University; M.S.(E.E.) 1965, Ph.D. 1968, Georgia Institute of Technology

Edward Charles Kollmann, *Adjunct Professor of Engineering*
B.S. 1941, Bowdoin College; M.A. 1947, Ph.D. 1950, Harvard University

Nicholas Kyriakopoulos, *Associate Professor of Engineering*
B.E.E. 1960, M.S. in Engr. 1963, D.Sc. 1968, George Washington University

Kirby Lamar, *Assistant Professorial Lecturer in Engineering*
B.S. 1949, U.S. Military Academy; M.S.E. 1955, University of Michigan

George Elwood Lamphere, *Associate Professorial Lecturer in Engineering*
B.S. 1952, Haverford College; B.S. 1954, Massachusetts Institute of Technology; LL.B. 1963, George Washington University

Joan Carol Laughren Lane, *Assistant Professorial Lecturer in Engineering*
B.A. 1966, University of Wisconsin; M.S. 1973, George Washington University

Roger Henry Lang, *Associate Professor of Engineering and Applied Science*
B.S. in E.E. 1962, M.S. in E.E. 1964, Ph.D. 1968, Polytechnic Institute of Brooklyn

Henry Edward Lee, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1967, Pennsylvania State University; M.S. 1968, Ph.D. 1970, University of Pennsylvania

James Der-Yi Lee, *Assistant Research Professor of Engineering*
B.S. 1964, Taiwan University; M.S. 1967, Rice University; Ph.D. 1971, Princeton University

Ting N. Lee, *Associate Professor of Engineering and Applied Science*
B.S. in E.E. 1962, Cheng Kung University, Taiwan; M.S. in E.E. 1965, Illinois Institute of Technology; Ph.D. 1972, University of Wisconsin—Madison

David Richard Levin, *Associate Professorial Lecturer in Engineering*
B.A. 1934, M.A. 1936, LL.B. 1936, Ph.D. 1937, J.D. 1966, University of Wisconsin

S. Benedict Levin, *Research Professor of Engineering Administration*
B.A. 1951, B.S. 1952, Columbia University

Robert Sidney Levine, *Professorial Lecturer in Engineering*
B.Sc. 1943, Iowa State University; M.Sc. 1946, Sc.D. 1949, Massachusetts Institute of Technology

Herbert Arthur Leybold, *Associate Professorial Lecturer in Engineering*
B.C.E. 1955, Polytechnic Institute of Brooklyn; M.S. in M.E. 1963, Virginia Polytechnic Institute and State University; Ph.D. 1969, North Carolina State University at Raleigh

Harold Liebowitz, *Professor of Engineering and Applied Science; Dean of the School of Engineering and Applied Science*
B.Ae.E. 1944, M.Ae.E. 1946, D.Ae.E. 1948, Polytechnic Institute of Brooklyn

Elmer Lipsey, *Visiting Research Professor of Engineering and Applied Science*
B.S. 1944, U.S. Coast Guard Academy; M.S. in E.E. 1958, Air Force Institute of Technology; D.Sc. 1975, George Washington University

Murray Howard Loew, *Associate Professorial Lecturer in Engineering*
B.S.E.E. 1965, Drexel Institute of Technology; M.S.E.E. 1967, Ph.D. 1972, Purdue University

Laurence Keith Loftin, Jr., *Professorial Lecturer in Engineering*
B.M.E. 1943, University of Virginia

Metin Lokmanhekim, *Associate Research Professor of Engineering*
B.S. 1951, Mersin Lycee, Turkey; M.S. 1956, Istanbul Technical University

Robert John Lynch, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1963, Naval Postgraduate School; M.E.A. 1975, George Washington University

William Alan MacDonald, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1967, Tri-State College; M.S. in E.E. 1970, Georgia Institute of Technology

Duncan MacKinnon, *Associate Professorial Lecturer in Engineering*
B.A.S. 1961, University of Toronto; M.S. 1964, Ph.D. 1966, Cornell University

Khalid Mahmood, *Professor of Engineering*
B.A. 1950, B.S. 1953, Panjab University; M.S. 1964, University of Washington; Ph.D. 1971, Colorado State University

Charles Santo Maiorana, *Associate Professorial Lecturer in Engineering*
B.S. in Engr. 1963, University of Michigan; M.S. 1967, George Washington University

J. Richard Margulies, *Assistant Professorial Lecturer in Engineering*
B.S. 1967, Cornell University; M.E.A. 1971, George Washington University; J.D. 1974, Georgetown University

William Henry Marlow, *Professor of Operations Research*
B.S. 1947, St. Ambrose College; M.S. 1948, Ph.D. 1951, University of Iowa

Joseph Durward Marsh, Jr., *Assistant Professor of Operations Research*
B.I.E. 1967, M.S. in I.E. 1969, University of Florida; Ph.D. 1973, Georgia Institute of Technology

Patrick John Martin, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Iona College; M.S. 1965, D.Sc. 1972, George Washington University

Ward Douglas Maurer, *Professor of Engineering and Applied Science*
B.S. 1958, University of Chicago; M.A. 1962, Ph.D. 1965, University of California, Berkeley

Richard McConnell, *Associate Professorial Lecturer in Engineering*
B.C.E. 1950, George Washington University; M.S. 1960, University of Illinois; Ph.D. 1974, Catholic University of America

Garth Philip McCormick, *Professor of Applied Science*
B.A. 1956, Oberlin College; M.A. 1959, University of Michigan

Thomas McGean, *Associate Professorial Lecturer in Engineering*
B.M.E. 1959, New York University; M.S. 1960, California Institute of Technology

Gerald Robert McNichols, *Associate Professorial Lecturer in Engineering*
M.S. 1965, Case Western Reserve University; M.S. 1966, University of Pennsylvania; D.Sc. 1967, George Washington University

Alvin Greene McNish, *Adjunct Professor of Engineering*
B.A. 1924, M.A. 1931, George Washington University

Subhash Mehrotra, *Associate Professorial Lecturer in Engineering*
B.Tech. 1959, I.I.T. Kharagpur, India; M.S. 1967, University of Iowa; Ph.D. 1973, University of California

Arnold Charles Meltzer, *Professor of Engineering and Applied Science*
B.S. in Engr. 1958, M.S. in Engr. 1961, D.Sc. 1967, George Washington University

Joshua Menkes, *Professorial Lecturer in Engineering*
B.S. 1953, Polytechnic Institute of Brooklyn; Ph.D. 1956, University of Michigan

Richard Eugene Merwin, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1943, Ph.D. 1965, University of Pennsylvania; M.S. in E.E. 1960, Syracuse University

Roger Neil Millen, *Associate Professor of Engineering*
B.S. 1959, M.S. 1965, University of Massachusetts; Ph.D. 1970, Purdue University

Douglas Miller, *Visiting Associate Professor of Operations Research*
B.S. 1966, Carnegie-Mellon University; M.A. 1969, Ph.D. 1971, Cornell University

Charles Molloy, *Professorial Lecturer in Engineering*
B.S. 1935, The Cooper Union; M.S. 1938, Ph.D. 1948, New York University

Raymond Clifton Montgomery, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1964, University of Alabama; Ph.D. 1969, Virginia Polytechnic Institute and State University

Franklin David Moore, *Assistant Professorial Lecturer in Engineering*
B.S. 1961, Texas A&M University; M.S. 1963, Purdue University; Ph.D. 1966, University of Iowa

David Dunstan Moran, *Associate Professorial Lecturer in Engineering*
B.S. 1965, M.S. 1967, Massachusetts Institute of Technology; Ph.D. 1971, University of Iowa

Daniel Mulville, *Assistant Professorial Lecturer in Engineering*
B.S.(M.E.) 1962, M.S. 1966, George Washington University; Ph.D. 1974, Catholic University of America

Michael Kenneth Myers, *Associate Professor of Applied Science*
B.A. 1962, Willamette University; B.S. 1962, M.S. 1963, Ph.D. 1966, Columbia University

Richard Peter Nalesnik, *Professorial Lecturer in Engineering*
B.S. 1960, M.S. 1963, Boston University; Ph.D. 1972, American University

Christopher Ng, *Assistant Professorial Lecturer in Engineering*
B.S. 1944, Chiao-Tung University (China); M.S. 1959, University of Connecticut; Ph.D. 1973, University of Maryland

Theodore Nieh, *Associate Professorial Lecturer in Engineering*
B.S. 1962, M.S. 1962, Massachusetts Institute of Technology

Ahmed Khairy Noor, *Professor of Engineering*
B.S. 1958, Cairo University; M.S. 1961, Ph.D. 1963, University of Illinois at Urbana-Champaign

Harold Vincent Nutt, *Research Professor of Engineering*
B.S. in M.E. 1932, Iowa State University of Science and Technology; M.A. 1964, George Washington University

Michel Kazuo Ochi, *Professorial Lecturer in Engineering*
B.Eng. 1944, Osaka Imperial University; M.A. 1967, American University; D.Eng. 1957, Osaka University

Morris Solomon Ojalvo, *Professorial Lecturer in Engineering and Applied Science*
B.M.E. 1944, The Cooper Union; M.M.E. 1949, University of Delaware; Ph.D. 1962, Purdue University

Walter Olstad, *Professorial Lecturer in Engineering*
B.S. 1954, Brown University; M.S. 1958, Virginia Polytechnic Institute and State University; Ph.D. 1967, Harvard University

Peter Gregory O'Neill, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, La Salle College; M.E.A. 1974, George Washington University

John Pachter, *Professorial Lecturer in Engineering*
B.A. 1963, Tulane University; J.D. 1966, LL.M. 1970, George Washington University

Constantine Papadakis, *Assistant Professorial Lecturer in Engineering*
M.S.(C.E.) 1970, University of Cincinnati; Ph.D. 1973, University of Michigan

Jae H. Park, *Assistant Professorial Lecturer in Engineering*
B.S. 1961, Seoul National University; M.S. 1967, Wilkes College; Ph.D. 1972, University of Colorado

Kent Stephen Park, *Assistant Professorial Lecturer in Engineering*
B.S. 1964, Shippensburg State College; M.S. in Applied Math. 1967, Ph.D. 1970, North Carolina State University at Raleigh

John Pasta, *Adjunct Professor of Engineering and Applied Science*
B.S. 1946, City University of New York, City College; Ph.D. 1951, New York University

Robert Lewis Paullin, *Associate Professorial Lecturer in Engineering*
B.S.(M.E.) 1950, South Dakota School of Mines and Technology; M.S.(C.E.) 1966, University of California, Berkeley

Harry Perry, *Adjunct Professor of Engineering*
B.S.(C.E.) 1940, University of Pennsylvania; M.S. 1941, University of Pittsburgh

Raymond Pickholtz, *Professor of Engineering and Applied Science*
B.E.E. 1954, M.E.E. 1958, City University of New York, City College; Ph.D. 1966, Polytechnic Institute of Brooklyn

David Alan Pierce, *Associate Professorial Lecturer in Engineering*
B.A. 1964, Carleton College; M.S. 1966, Ph.D. 1968, University of Wisconsin

Douglas Haig Pugh II, *Assistant Professorial Lecturer in Engineering*
B.A. 1973, University of Maryland

Arthur Henry Purcell, *Associate Professorial Lecturer in Engineering*
B.S. 1966, Cornell University; M.S. 1971, Ph.D. 1972, Northwestern University

Manuel Jack Queijo, *Professorial Lecturer in Engineering*
B.S. 1944, Worcester Polytechnic Institute; M.S. 1954, University of Virginia; Ph.D. 1963, Virginia Polytechnic Institute and State University

Michael Jerome Rabins, *Professorial Lecturer in Engineering*
B.S. 1953, Massachusetts Institute of Technology; M.S. 1955, Carnegie Institute of Technology; Ph.D. 1959, University of Wisconsin

Walter Phillip Reid, *Adjunct Professor of Engineering*
B.S. 1938, M.S. 1939, Carnegie-Mellon University; Ph.D. 1942, University of Pittsburgh

Richard Coughlin Reynolds, *Assistant Professorial Lecturer in Engineering*
B.A. 1965, George Washington University; B.S. in E.E. 1966, Naval Postgraduate School; M.S.E. 1971, University of Michigan

Lucius Joseph Riccio, *Assistant Professorial Lecturer in Engineering*
B.S. in I.E. 1969, M.S. in I.E. 1970, Ph.D. 1973, Lehigh University

James Bratton Robertson, *Assistant Professorial Lecturer in Engineering*
B.S. 1956, The Citadel; B.S. 1961, M.S. 1962, Clemson University; Ph.D. 1966, Virginia Polytechnic Institute and State University

Derrill Conway Rohlfs, *Associate Professorial Lecturer in Engineering*
B.E.E. 1955, M.S. in Engr. 1959, George Washington University

Sam Rothman, *Professor of Engineering Administration*
B.S. 1943, Long Island University; M.A. 1954, Ph.D. 1959, American University

Meir Rozansky, *Assistant Professorial Lecturer in Engineering*
B.S.(M.E.) 1973, M.E.A. 1974, George Washington University

Llewellyn Adam Rubin, *Associate Professorial Lecturer in Engineering*
B.S.(E.E.) 1955, M.S.(E.E.) 1958, University of Pennsylvania

Harry Runyan, Jr., *Associate Research Professor of Engineering*
B.S.(M.E.) 1939, Rutgers—The State University (New Brunswick); M.A.E. 1951, University of Virginia; Ph.D. 1974, Loughborough University of Technology

John Madison Russell III, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1962, Virginia Polytechnic Institute and State University; M.E.E. 1966, University of Virginia; Ph.D. 1970, University of Michigan

Gajanan Sabnis, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1961, University of Bombay; M.Tech. 1963, Indian Institute of Technology, Bombay; Ph.D. 1967, Cornell University

Kenneth Saczalski, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1963, University of Miami; M.S. 1967, University of Rochester; Ph.D. 1970, University of Wisconsin—Madison

Nils Salvesen, *Associate Professorial Lecturer in Engineering*
B.S.E. 1960, M.S.E. 1961, Ph.D. 1966, University of Michigan

Robert Bruce Samworth, *Associate Professorial Lecturer in Engineering*
B.C.E. 1959, University of Delaware; M.S. in Engr. 1962, Johns Hopkins University; Ph.D. 1968, Cornell University

John Baptist Scalzi, *Professorial Lecturer in Engineering*
B.S. 1938, Worcester Polytechnic Institute; M.S. 1940, D.Sc. 1951, Massachusetts Institute of Technology

Allan Schneider, *Associate Professorial Lecturer in Engineering*
B.S.(E.E.) 1959, B.S.E.P. 1960, Lehigh University; M.S. in E.E. 1962, Columbia University; Ph.D. 1974, University of Maryland

Richard Edgar Schneider, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1961, Villanova University; M.S. in E.E. 1971, Rochester Institute of Technology

Leonard Schuchman, *Associate Professorial Lecturer in Engineering*
B.B.A. 1957, B.E.E. 1960, City University of New York, City College; M.S. 1962, Stanford University

Jay William Schwartz, *Associate Professorial Lecturer in Engineering*
B.S. 1956, University of Pennsylvania; M.S. 1960, Ph.D. 1964, Yale University

Richard Sears, *Assistant Professorial Lecturer in Engineering*
B.M.E. 1964, M.M.E. 1968, City University of New York, City College

Presson Scott Shane, *Professor of Engineering Administration*
B.S. in Ch.E. 1941, University of Kansas; M.S. 1946, Massachusetts Institute of Technology

Craig Conway Sherbrooke, *Professorial Lecturer in Engineering*
B.S. 1956, M.S. 1960, Massachusetts Institute of Technology; Ph.D. 1969, University of California, Los Angeles

John Norman Shoosmith, *Assistant Professorial Lecturer in Engineering*
B.Sc. 1959, Queen's University, Toronto; M.S. 1967, College of William and Mary; Ph.D. 1973, University of Virginia

Arnold Roy Shulman, *Associate Professorial Lecturer in Engineering*
B.E.E. 1948, New York University; M.S. in E.E. 1953, Newark College of Engineering

Robert David Shults, *Associate Professorial Lecturer in Engineering*
B.E.E. 1960, M.S. in E.E. 1963, Ph.D. 1968, Georgia Institute of Technology

Nozer Darabsha Singpurwalla, *Professor of Operations Research and Research Professor of Statistics*
B.S. 1959, B.V. Bhoomraddi College of Engineering and Technology, India; M.S (I.E.) 1964, Rutgers—The State University (New Brunswick); Ph.D. 1968, New York University

Earl Franklin Skelton, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Fairleigh Dickinson University; Ph.D. 1967, Rensselaer Polytechnic Institute

Nicholas Arthur Sloan, *Associate Professorial Lecturer in Engineering*
B.S. 1956, University of Maryland; M.S. 1967, D.Sc. 1971, J.D. 1974, George Washington University

George Louis Smith, *Assistant Professorial Lecturer in Engineering*
B.S. 1960, M.S. 1963, Ph.D. 1968, Virginia Polytechnic Institute and State University

Joseph Borden Smith, Jr., *Associate Professor of Engineering Administration*
B.S. in E.E. 1933, University of Florida; M.E.A. 1956, D.Sc. 1966, George Washington University

Jaroslaw Sobieszczanski, *Associate Professorial Lecturer in Engineering*
B.S. 1955, M.S. 1957, Ph.D. 1964, Technical University of Warsaw

Robert Martin Sorensen, *Adjunct Professor of Engineering*
B.S. in C.E. 1960, Newark College of Engineering; M.S. in C.E. 1962, Lehigh University; Ph.D. 1966, University of California, Berkeley

Arthur Sosslau, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1957, Polytechnic Institute of Brooklyn

Manuel Stein, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1943, University of Pittsburgh; M.Ae.E. 1951, University of Virginia; Ph.D. 1958, Virginia Polytechnic Institute and State University

Henry Malcolm Steiner, *Professor of Engineering Administration*
B.A. in M.E. 1944, M.S. 1950, Ph.D. 1965, Stanford University

Robert Louis Stermer, Jr., *Associate Professorial Lecturer in Engineering*
B.E.E. 1960, M.E.E. 1965, University of Virginia; Ph.D. 1971, Duke University

Terry Anthony Straeter, *Assistant Professorial Lecturer in Engineering*
B.A. 1964, William Jewell College; M.A. 1966, College of William and Mary; Ph.D. 1971, North Carolina State University at Raleigh

Calvin Thomas Swift, *Assistant Professorial Lecturer in Engineering*
B.S. 1959, Massachusetts Institute of Technology; M.S. 1965, Virginia Polytechnic Institute and State University; Ph.D. 1969, College of William and Mary

Andrew Joa-Hwa Tay, *Assistant Professor of Engineering*
B.S. in C.E. 1971, National Taiwan University; M.S. 1972, University of Cincinnati; Ph.D. 1976, University of Toronto

Ronald Halsey Thompson, *Associate Professorial Lecturer in Engineering*
B.A. 1950, Adelphi College; M.A. 1951, Columbia University; Ph.D. 1959, University of Pennsylvania

Robb Milton Thomson, *Professorial Lecturer in Engineering*
M.S. 1950, University of Chicago; Ph.D. 1953, Syracuse University

Dennis Peter Tihansky, *Associate Research Professor of Operations Research*
B.A. 1965, Washington and Jefferson College; M.S. 1967, Ph.D. 1970, Harvard University

Robert Yen-ying Ting, *Assistant Professorial Lecturer in Engineering*
B.S. 1964, National Taiwan University; M.S. 1967, Massachusetts Institute of Technology; Ph.D. 1971, University of California at San Diego

Larry William Tombaugh, *Adjunct Professor of Engineering*
B.S. 1960, Pennsylvania State University; M.S. 1963, Colorado State University; Ph.D. 1968, University of Michigan

Theodore George Toridis, *Professor of Engineering and Applied Science*
B.S. 1954, Robert College, Turkey; M.S. 1961, Ph.D. 1964, Michigan State University

Avtar Krishan Trehan, *Adjunct Assistant Professor of Engineering*
B.S. 1962, University of Allahabad, India; M.S. 1967, Brown University; Ph.D. 1971, University of Maryland

Jerry Hassell Tucker, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1963, Mississippi State University; M.S. in E.E. 1970, University of Virginia

Warren Viessman, Jr., *Professorial Lecturer in Engineering*
B.E. 1952, M.S.E. 1958, D.Engr. 1961, Johns Hopkins University

Ernst Volgenau, *Associate Professorial Lecturer in Engineering*
B.S. 1955, U.S. Naval Academy; M.S. in E.E. 1959, Air Force Institute of Technology; Ph.D. 1966, University of California, Los Angeles

Jerry Lee Wagner, *Assistant Professorial Lecturer in Engineering*
B.S.(M.E.) 1967, University of Rhode Island; M.S.(M.E.) 1969, Lehigh University

Thomas Michael Walsh, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1953, Ohio University; M.S.E. 1962, University of Akron

Richard Currey Warder, Jr., *Professorial Lecturer in Engineering*
B.S. 1958, South Dakota School of Mines and Technology; M.S. 1959, Ph.D. 1963, Northwestern University

Wasyl Wasylkiwskyj, *Associate Professorial Lecturer in Engineering*
B.E.E. 1957, City University of New York, City College; M.S. in E.E. 1965, Ph.D. 1968, Polytechnic Institute of Brooklyn

Ernst Weber, *Adjunct Professor of Engineering and Applied Science*
Dipl. Engr. 1924, D.Sc. 1927, Technical University, Vienna; Ph.D. 1926, University of Vienna

Benjamin Whang, *Associate Professorial Lecturer in Engineering*
B.C.E. 1959, M.C.E. 1961, Polytechnic Institute of Brooklyn; Ph.D. 1968, Massachusetts Institute of Technology

John Lindsey Whitesides, Jr., *Associate Professor of Engineering and Applied Science*
B.E. 1965, Ph.D. 1968, University of Texas at Austin

Robert Wilson, *Professorial Lecturer in Engineering*
B.S. 1941, M.S. 1942, Georgia Institute of Technology; Ph.D. 1952, University of Texas at Austin

Thomas Charles Winter, Jr., *Adjunct Assistant Professor of Engineering and Applied Science*
B.S. 1956, U.S. Military Academy; M.A. 1961, Ph.D. 1966, University of California, Los Angeles

John Leonard Wolfgang, Jr., *Assistant Professorial Lecturer in Engineering*
B.E.E. 1962, M.S. in Engr. 1967, George Washington University

John William Woods, *Assistant Professorial Lecturer in Engineering*
B.S. 1965, M.S., E.E. 1967, Ph.D. 1970, Massachusetts Institute of Technology

Michael Yachnis, *Professorial Lecturer in Engineering*
B.S. 1943, Military College, Athens; B.S. in C.E. 1951, Military Technical Training College, Athens; M.S. in Engr. 1956, M.E.A. 1962, D.Sc. 1968, George Washington University

Jann-Nan Yang, *Associate Professor of Engineering and Applied Science*
B.S. 1961, National Taiwan University; M.S. 1964, University of Hawaii; D.Sc. 1967, Columbia University

Edward Carson Yates, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1948, M.S. 1949, North Carolina State University at Raleigh; M.S. 1953, University of Virginia; Ph.D. 1959, Virginia Polytechnic Institute and State University

Frank Levi Young, *Professorial Lecturer in Engineering*
B.S. 1950, U.S. Naval Academy; M.S.(Aero) 1958, Air Force Institute of Technology; Ph.D. 1965, University of Texas at Austin

Shao Wen Yuan, *Professor of Engineering and Applied Science*
B.S. 1936, University of Michigan; M.S. 1937, Ph.D. 1941, California Institute of Technology; Ae.E. 1939, Stanford University

Robert Mayer Zeskind, *Associate Professorial Lecturer in Engineering*
B.S.E. 1965, Case Western Reserve University; M.S. 1968, D.Sc. 1973, George Washington University

Tse-Fou Zien, *Associate Professorial Lecturer in Engineering*
B.S. 1958, National Taiwan University; M.S. 1963, Brown University; Ph.D. 1967, California Institute of Technology

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GRADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.), and Doctor of Philosophy (Ph.D.)

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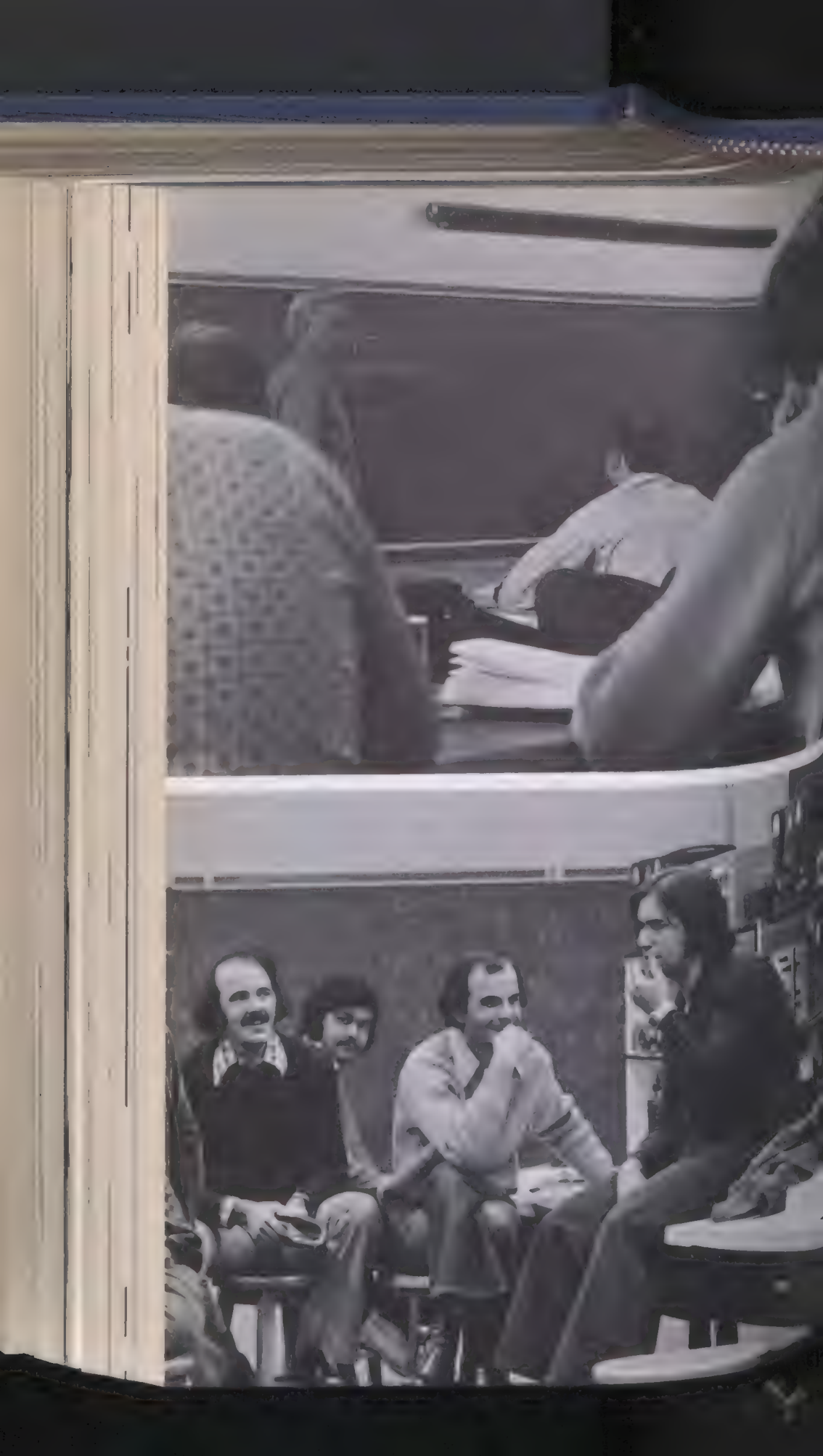
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THE SCHOOL OF EDUCATION, 1907

THE SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION, 1928

THE SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS, 1928

THE DIVISION OF UNIVERSITY STUDENTS, 1930

THE COLLEGE OF GENERAL STUDIES, 1950

THE SUMMER SESSIONS, 1916

THE UNIVERSITY HOSPITAL, 1898

THE DIVISION OF EXPERIMENTAL PROGRAMS, 1973

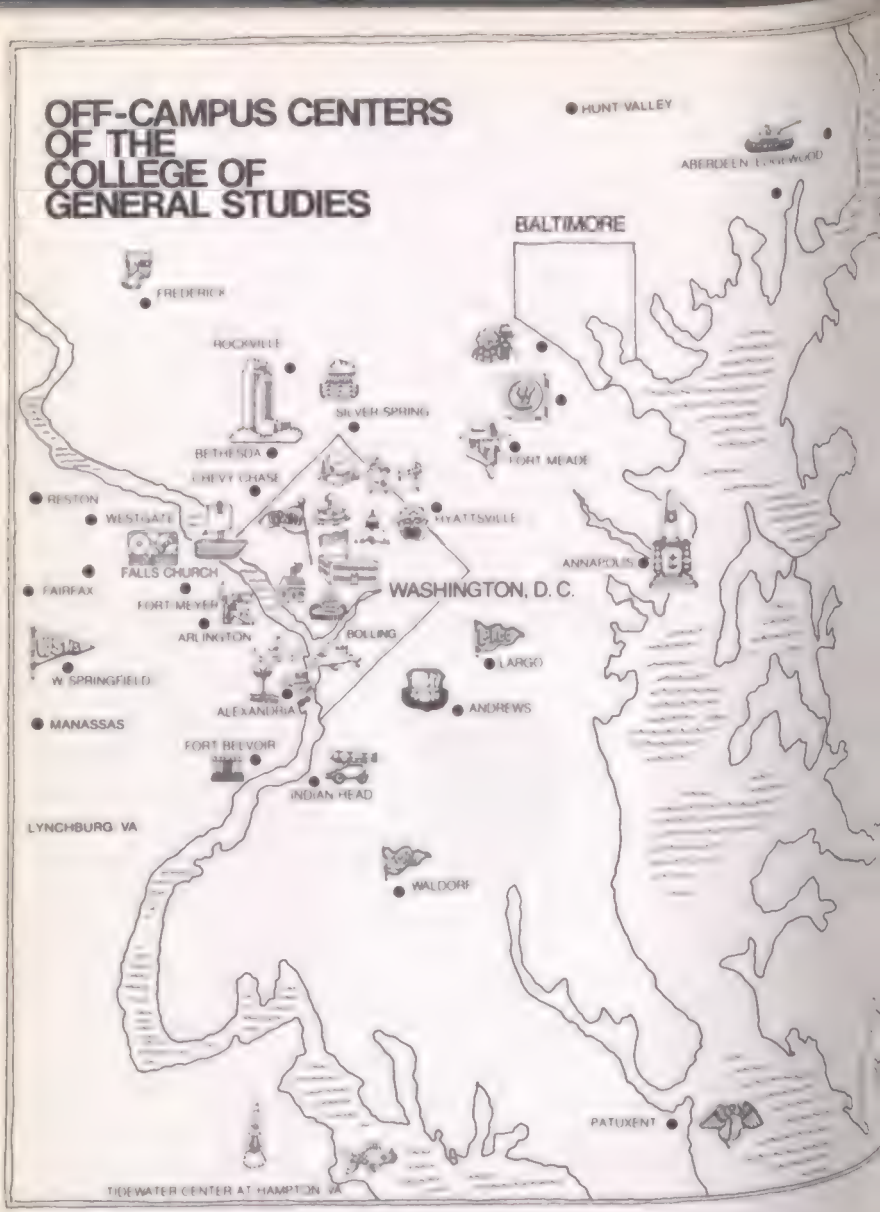
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1977-78



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THE COLLEGE OF GENERAL STUDIES 1977–78

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Since its inception in 1950, the College of General Studies has been involved in the organization and administration of an increasing variety of off-campus programs. Today we offer a range of credit programs from the associate to the doctoral level, with course content, faculty qualifications, and degree requirements essentially the same as the on-campus programs of the university.

Building and maintaining programs that command academic and professional respect is an important and continuing concern for the College. We feel we have a major asset in our close organizational relationship with the academic departments of the various undergraduate, graduate, and professional divisions on campus. Decisions concerning academic content for all credit programs rest with the appropriate campus division, and faculty for off-campus programs are selected and approved by the academic departments according to university-wide standards for expertise and experience.

We recognize that we are dealing with a new, more involved, and often more demanding adult student population, which has emerged as the new majority in higher education, and which reflects the growing nationwide interest in recurrent education. Our program planners maintain close contact with the general community to determine how university resources can be applied most effectively. In addition, GW's status as a private university has been an important element in providing the flexibility to establish new types of programs to meet emerging needs.

We look forward to increasing the spectrum of our educational programs through the activities of our new Office of Conferences and Seminars. We are moving ahead to develop a growing selection of noncredit programs and we hope to rapidly increase our capability in this area.

Robert L. Holland
Dean
College of General Studies

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THE CALENDAR 1977–78*

AUGUST 1977

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1977 FALL SEMESTER

August 24–September 12	Off-campus registration† (days of registration and beginning classes will be announced in the *Off-Campus Schedule of Classes*) Application for February graduation due as part of registration
‡September 1–3	Registration on campus† *Thursday–Saturday* Application for February graduation due as part of registration
September 5	Labor Day (holiday) *Monday*
September 6	On-campus classes begin *Tuesday*
September 10	Off-campus Faculty Meeting *Saturday*
September 15	Off-campus classes begin *Thursday*
October 10	Columbus Day—no off-campus classes *Monday*
October 24	Veterans Day—no off-campus classes *Monday*
November 10	D.Sc. dissertations of February candidates due *Thursday*
November 12	M.S. in Administration Field Examinations *Saturday*
November 23	Thanksgiving recess begins after last class *Wednesday*

* Off-campus courses organized at any time.

† Application for Master's Comprehensive Examinations is the student's responsibility and must be made when registering for last courses required for degree.

‡ Hours of registration will be announced in the *Schedule of Classes*.

November 28	Classes resume *Monday*
November 30	School of Engineering and Applied Science Master's theses of February candidates due *Wednesday*
December 6	Last day of campus classes *Tuesday*
December 10	M.A. in Education Comprehensive Examinations *Saturday*
December 12–21	Campus examination period *Monday–Wednesday*
December 19	Last day of off-campus classes *Monday*
January 2	Master's Theses (other than those in the School of Engineering and Applied Science) of February candidates due *Monday*

1978 SPRING SEMESTER

January 2–13	Off-campus registration* (days of registration and beginning classes will be announced in the *Off-Campus Schedule of Classes)*
	Applications for May graduation due as part of registration
†*January 12–14*	Registration on campus* *Thursday–Saturday*
	Applications for May graduation due as part of registration
January 16	On-campus classes begin *Monday*
January 16	Off-campus classes begin *Monday*
February 20	Winter Convocation (holiday) *Monday*
March 11	Spring recess begins after last class *Saturday*
March 17	Application for M.A. in Education Comprehensive Examinations due *Friday*
March 20	Classes resume *Monday*
March 22	D.Sc. dissertations of May candidates due *Wednesday*
April 7	School of Engineering and Applied Science Master's theses of May candidates due *Friday*
April 15	M.S. in Administration Field Examinations *Saturday*
April 17	M.S. in Administration theses of May candidates due *Monday*
April 21	Last day of campus classes *Friday*
April 22	M.A. in Education Comprehensive Examinations *Saturday*
April 24	Last day of off-campus classes *Monday*
April 25–May 1	Off-campus examination period *Tuesday–Monday*
April 27–May 6	Campus examination period *Thursday–Saturday*
May 7	Commencement *Sunday*

1978 SUMMER SESSIONS

There are two seven-week sessions and one fourteen-week session. Days of registration and beginning classes will be announced in the *Off-Campus Schedule of Classes.*

* Application for Master's Comprehensive Examinations is the student's responsibility and must be made when registering for last courses required for degree.
† Hours of registration will be announced in the on-campus *Schedule of Classes.*

THE UNIVERSITY

HISTORY

GEORGE WASHINGTON UNIVERSITY had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area is not without its reminders of historic interest to the University. President Monroe, who signed the charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes 12 colleges, schools, and divisions, as follows:

*Columbian College of Arts and Sciences** offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts and Bachelor of Science. The College also provides prelegal and premedical programs, and the preprofessional work required for admission to the School of Public and International Affairs. Columbian College has academic jurisdiction over the off-campus programs leading to the degrees of Associate in Arts in General Studies, Associate in Science in Cartographic Science, Associate in Science in Geodesy, Bachelor of General Studies, Bachelor of Science in Geodesy, Bachelor of Science in Cartographic Science, and Bachelor of Science in Oceanography. These off-campus programs are administered by the College of General Studies.

The Graduate School of Arts and Sciences†‡ offers advanced study and research leading to the degrees of Master of Arts, Master of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science in Special Studies, Master of Science for Teachers, and Doctor of Philosophy. The degrees of Master of Arts in Special Studies and Master of Science in Special Studies are also available through off-campus programs administered by the College of General Studies.

The School of Medicine and Health Sciences†† offers work leading to the degrees of Associate in Science, Bachelor of Science, and Doctor of Medicine.

The National Law Center‡ offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science; and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: Civil Engineering, Electrical Engineering, and Mechanical Engineering. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration,

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* Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

† The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Master of Science and Doctor of Medicine and a dual program leading to the degrees of Doctor of Medicine and Doctor of Philosophy.

‡ The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the College of General Studies.

The School of Education offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Bachelor of Science in Human Kinetics and Leisure Studies; graduate studies leading to the degrees of Master of Arts in Education, Master of Arts in Teaching, Education Specialist, and Doctor of Education. The degree of Master of Arts in Education is also available through off-campus programs administered by the College of General Studies.

*The School of Government and Business Administration** offers undergraduate programs leading to the degrees of Bachelor of Business Administration and Bachelor of Science in Health Care Administration; graduate programs leading to the degrees of Master of Arts in Health Care Administration, Master of Business Administration, Master of Public Administration, Master of Urban and Regional Planning; the Post-master's Graduate Certificate in Health Care Administration; the degrees of Doctor of Business Administration and Doctor of Public Administration. The School also has academic jurisdiction over the off-campus program leading to the degree of Master of Science in Administration. This off-campus program is administered by the College of General Studies.

*The School of Public and International Affairs** offers undergraduate programs leading to the degree of Bachelor of Arts and graduate programs leading to the degree of Master of Arts. The School also offers an off-campus program leading to the degree of Master of Science in International Affairs.

The College of General Studies supplements the adult education program of the University through campus and off-campus study; conferences, seminars, and special projects; and continuing education and noncredit programs. This College also administers the off-campus programs over which Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Engineering and Applied Science, the School of Education, and the School of Government and Business Administration have academic jurisdiction.

The Division of University Students makes available courses for students not candidates for degrees in this University.

The Division of Experimental Programs.

The Summer Sessions.

ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The National Law Center is a charter member of the Association of American Law Schools and is approved by the Section of Legal Education and Admissions to the Bar of the American Bar Association.

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* The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

The School of Medicine and Health Sciences is a member of the Association of American Medical Colleges and is one of the medical colleges which has been continuously approved by the American Medical Association.

Curricula of the School of Engineering and Applied Science in civil, electrical, and mechanical engineering are accredited by the Engineers' Council for Professional Development. The School of Education is a charter member of the American Association of Colleges for Teacher Education and is accredited by the National Council for Accreditation of Teacher Education for its bachelor's and master's degree programs. The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and the Certified Management Accountant professional examinations. The program in Hospital Administration is accredited by the National Accrediting Commission on Graduate Education for Hospital Administration. The Master of Urban and Regional Planning degree program is recognized by the American Institute of Planners. The Department of Chemistry is on the approved list of the American Chemical Society. The graduate program in clinical psychology in the Department of Psychology is on the approved list of the American Psychological Association. The program in speech pathology and audiology is accredited by the Education and Training Board of the American Boards of Examiners in Speech Pathology and Audiology.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

In accordance with the stated policy of its Board of Trustees and in conformity with federal laws and regulations, George Washington University does not discriminate against any person on the basis of sex, race, color, religion, or national origin in any of its education or employment programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 call for an explicit statement that the requirement not to discriminate on the basis of sex extends to employment in and admission to such programs and activities.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Miss Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052 or to the Director of the Office of Civil Rights of the Department of Health Education, and Welfare.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the United States Information Agency, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, the General Services Administration, the National Academy of Sciences, and the John F. Kennedy Center for the Performing Arts.

THE GENERAL ALUMNI ASSOCIATION

The objectives of this Association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have matriculated in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those who are life members of the George Washington University General Alumni Association or the Alumni Association of any school of the University, or are current contributors to the George Washington University Fund.

The Alumni Office is located in Alumni House, 714 21st Street, N.W., Washington, D.C. 20052.

All alumni are urged to keep the Alumni Office informed of changes of address or occupation and to supply information with regard to their fellow alumni.

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The University is privately endowed and is governed by a Board of Trustees of which the President of the University is an *ex officio* member.

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Associate Deans C.M. Chambers, A.C. Jensen
Assistant Dean Ruth H. Osborn

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INTRODUCTION

The College of General Studies, the off-campus division of George Washington University, was established in 1950 to extend the educational resources of the University to the community. The College continues in expanding the University's activities by providing academic programs for adult students and



by helping to meet the continuing educational requirements of the National Capital area.

The College offers off-campus credit courses for the nondegree student, whether for personal enrichment or for updating or upgrading professional credentials. Off-campus degree programs, administered by the College of General Studies for other colleges and schools of the University, are offered at the undergraduate and graduate levels for students who wish to pursue a more formal program of study. Experimental pilot programs of study are developed in cooperation with other colleges and schools of the University in response to specific needs of the government and business community. The College also develops and conducts noncredit courses, seminars, and workshops drawing on the resources of the University.

The staff of instruction for the off-campus programs includes members of the full-time faculty of the University and academically qualified part-time lecturers from the Washington professional community.

The College works closely with education directors, public school officials, and personnel administrators in government, business, and industry to develop courses of study and expand the educational opportunities for the mature student. In cooperation with these sponsoring groups the College offers courses at off-campus centers throughout the District of Columbia and in nearby Maryland and Virginia. Government agencies and installations, business organizations, or professional groups interested in having the College organize and conduct a course or a comprehensive educational program should contact the Associate Dean of the College of General Studies.

ACADEMIC STATUS

The academic standards of the University are maintained in off-campus credit courses.

The College of General Studies is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

DEGREE PROGRAMS

Columbian College of Arts and Sciences offers the following degrees off campus:

Associate in Arts in General Studies
Associate in Science in Cartographic Science
Associate in Science in Geodesy
Bachelor of General Studies
Bachelor of Science in Geodesy
Bachelor of Science in Cartographic Science
Bachelor of Science in Oceanography

The Graduate School of Arts and Sciences offers the following degrees off campus:

Master of Arts in Special Studies
Master of Science in Special Studies

The School of Engineering and Applied Science offers the following degrees off campus:

Master of Engineering Administration
Master of Science
Doctor of Science

The School of Education offers the following degrees off campus:
Master of Arts in Education
Education Specialist
The School of Government and Business Administration offers the following degree off campus:
Master of Science in Administration

SPECIAL CREDIT PROGRAMS AND NONDEGREE PROGRAMS

SPECIAL CREDIT PROGRAMS

Special credit courses and programs designed to meet the needs of interested individuals, groups, and agencies are offered in the liberal arts, education, and other areas. From time to time such offerings include foreign-tour programs and other programs of a continuing education nature. For further information contact one of the persons listed below.

NONDEGREE PROGRAMS

Courses, conferences, seminars, and institutes are offered to meet the needs of individuals and groups. They are designed for business, industry, and professional groups. For further information contact one of the persons listed below.

For information on programs in a general area, contact Charles Chambers, Associate Dean of the College of General Studies, telephone 676-7070.

For information on LEEP programs, contact David A. Rowley, telephone 676-6210.

For information on Continuing Education for Women programs, contact Ruth Osborn, Assistant Dean of the College of General Studies, telephone 676-7036.

For information on Teacher's Programs, contact the geographic area director (see below).

For information on credit and noncredit programs in specific geographic areas, contact Ralph DeBelles, Director of District of Columbia Programs, telephone 676-7061; Douglas Carter, Director of Maryland Programs, telephone 676-7022; John Morrow, Director of Virginia Programs, telephone 676-7040.

Admission

NONDEGREE STUDENTS

Off-campus credit courses may be taken by nondegree students who meet the prerequisites prescribed by the department concerned. A student who has been dismissed or required to withdraw from this or another institution is not eligible to register for at least one fall or one spring semester from the date of such action. Formal University admission is not required for registration.

Nondegree students wishing to enroll in graduate courses other than those offered by the School of Government and Business Administration must have completed a bachelor's degree or have completed 90 semester hours of undergraduate work and the permission of the instructor. Nondegree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration. (See page 21 for admission requirements for graduate programs in the School of Engineering and Applied Science.)

Credits earned as a nondegree student may later be transferred to degree programs at George Washington University or other colleges and universities, providing that they are applicable to the desired curriculum, that the student meets the requirements of the degree program for which application is being made, and that all other requirements of the appropriate school are met.

ADMISSION AS A DEGREE CANDIDATE

Students wishing to be admitted as candidates for one of the off-campus undergraduate or graduate degree programs of George Washington University may obtain application forms from the College of General Studies, one of the University's off-campus representatives, or the education officer of their agencies or installations. For information on the procedure to be followed when applying for admission to campus degree programs, refer to the appropriate George Washington University bulletin.

An application for admission, required credentials, and a nonrefundable application fee* of $10 (for undergraduate study) or $25 (for graduate study) should be sent to the appropriate office.

Records presented become the property of the University and *cannot* be returned.

Undergraduate Degree Candidacy—Columbian College of Arts and Sciences

Completed application, required credentials, and the application fee should be sent to the Office of Admissions, George Washington University, N.W., Washington, D.C. 20052.

Secondary school graduates applying for Associate's or Bachelor's degree candidacy must present the combined evidence of (1) an acceptable certificate of graduation from an accredited secondary school, showing a minimum of fifteen "units"† in a college preparatory or academic curriculum; (2) College Entrance Examination Board scores on the Scholastic Aptitude Test and the English Composition Achievement Test. The College Entrance Examination Board tests are preferred; however, the American College Testing Battery scores will be accepted, (for students out of high school several years, other appropriate tests may be prescribed). The applicant should request that

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*The application fee must be by check or postal money order, payable to George Washington University.

The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences, and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

†A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

these scores be sent to the Office of Admissions directly from the Educational Testing Service, Princeton, N.J., or Berkeley, Calif.; or from the American College Testing Program, Iowa City, Iowa.

Mature students who do not meet the above requirements may be considered for degree candidacy after the satisfactory completion of at least 15 semester hours of course work with a grade-point average of 2.00 or better. This must include courses in English Composition (Engl 9 or 10 and 11) and 9 semester hours of course work in at least two of the following appropriate areas: Humanities (literature, philosophy, foreign languages), Social Studies (anthropology, economics, geography, history, political science, psychology, sociology), Natural and Mathematical Sciences.

The selection of qualifying courses should be made in conference with the faculty advisor, and a conference concerning plans for study is required of each applicant for admission to candidacy.

ADVANCED STANDING AND ADVANCED PLACEMENT

TRANSFER STUDENTS FROM OTHER COLLEGES AND UNIVERSITIES

Properly certified courses taken at accredited colleges or universities may be applied toward a degree, subject to the curriculum requirements of the degree program and the rules of the Columbian College of Arts and Sciences.

Although a grade of *D* is not acceptable for transfer, the course may be used to satisfy a curriculum requirement. Credits completed with a *D* grade may not, however, be counted toward the total number of semester hours required for the degree. Any course completed with a grade of *D* or better may not be repeated for the purpose of earning degree credit.

Transfer students whose previous academic records raise doubts of their ability to complete degree requirements successfully must complete 15 hours of course work in this College with a quality-point index of 2.00 or higher, to be considered for degree candidacy. Courses taken to qualify for candidacy must be distributed over two or more of the following areas: Humanities (literature, philosophy, foreign language), Social Studies (anthropology, economics, geography, history, political science, sociology), and Natural and Mathematical Sciences. (Students who have not successfully completed an acceptable college course in English Composition must include Engl 9 or 10 and 11.) Applicants who have been suspended for academic reasons from this University or another institution must fulfill this same 15-hour requirement and also obtain written approval of a petition for admission to degree candidacy from the Committee on Admission and Advanced Standing of Columbian College of Arts and Sciences.

The University reserves the right to refuse credit for transfer in whole or in part, or to allow it provisionally. Credit so given may be withdrawn for subsequent poor work.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, George Washington University, Washington, D.C. 20052.

EARNING CREDIT OR WAIVING REQUIREMENTS BY EXAMINATION

In addition to credit allowed in transfer from other accredited colleges or universities, a maximum of 30 semester hours of advanced standing may be obtained by any one or any combination of the following methods.

A student may earn up to a maximum of 30 hours, or waive curricular requirements without limitation (*passing a waiver examination does not entitle the student to any semester hours of credit*), by performing satisfactorily on any or all of the following:

Advanced Placement Tests (APT).—Administered by the College Entrance Examination Board.

Achievement Tests (may be used to waive requirements only).—Administered by the College Entrance Examination Board.

College-Level Examination Program (CLEP).—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations, with the exception of the English composition examination, passed at the 50th percentile or above (college sophomore norms). Credit is assigned, with a few exceptions, for the Subject Examinations passed at the level recommended in the College Board model policy. A candidate for a degree must seek departmental approval *prior to* taking the examination to receive credit for a CLEP Subject Examination. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board, Box 1824, Princeton, N.J. 08540.*

Special Departmental Examinations in Columbian College of Arts and Sciences.—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. If a CLEP Subject Examination is available, the department may choose to employ it. Approval is not automatically granted; the student must offer evidence of sufficient background to have a reasonable command of the subject matter. (A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses.) Assigning credit (or waiving a requirement) by special departmental examinations will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A $25 fee for each course examination is charged for preparation, administration, and grading of the examination.

Service Schools.—A maximum of 30 (or a maximum of 12 hours if the courses are "professional") semester hours may be obtained on the basis of service schools satisfactorily completed, as evaluated in accordance with the *Guide to the Evaluation of Educational Experience in the Armed Forces.* Ordinarily such subjects are counted as electives. No credit will be allowed for military experience as such.

Correspondence Courses.—A maximum of 15 semester hours may be earned through the successful completion of correspondence courses of college level

* CLEP examinations in Introductory Accounting, Introduction to Business, Commercial Law, and Data Processing are limited to 3 credits each of advanced standing in the School of Government and Business Administration. All other CLEP examinations in Accounting and Business Administration (School of Government and Business Administration courses) are not accepted for advanced standing.

which are offered by the U.S. Armed Forces Institute or a regionally accredited college or university.

Examination for Waiving Curriculum Requirements.—A student wishing to omit a required course may, with the permission of the faculty advisor, take a waiver examination, the passing of which satisfies the curriculum requirement and qualifies the student for registration in an advanced course. The fee for each 3-hour course examination is $5. *Passing a waiver examination does not entitle a student to any semester hours of credit.*

Credit Earned Through United States Armed Forces Institute (USAFI) or Defense Activity for Non-Traditional Education Support (DANTES).—Credit is assigned for approved USAFI or DANTES college-level examinations passed with satisfactory scores.

Graduate Degree Candidacy

MASTER'S DEGREES

The Degree of Master of Arts in Education (School of Education).—Application for Master's degree candidacy should be filed by June 1 for the fall semester, November 1 for the spring semester, or April 1 for the summer session. The completed application, required credentials, and the application fee should be sent to the Office of the Dean, School of Education, 2201 G Street, N.W., Washington, D.C. 20052.

Admission to study toward a Master's degree requires a bachelor's degree from an accredited institution, an undergraduate quality-point index of at least 2.50 (a *C+* average), demonstrated interest in education, and appropriate undergraduate course work. Students whose quality-point index is in the range of 2.30 to 2.49 will be considered for provisional admission. The quality-point index is computed on the basis of the last two years of the bachelors' degree program and on all course work completed beyond the baccalaureate. Two years of successful teaching are required before admission to candidacy in the field of school administration. Appropriate experience is required for admission to programs in adult education and human resource development.

The Degree of Master of Science in Administration (School of Government and Business Administration).—Forms for application for admission or readmission are available at the Office of the Admissions Officer, School of Government and Business Administration, George Washington University, Washington, D.C 20052. When completed, application forms and all supporting credentials should be submitted to this Office no later than April 1 for the fall semester, November 1 for the spring semester, and May 1 for the summer sessions. Applicants who received their undergraduate degrees from foreign universities must submit applications one month earlier in each case.

To be considered for admission applicants must present the following minimum credentials: a bachelor's degree from a regionally accredited college or university that includes at least 90 semester hours of academic work with an overall undergraduate quality-point index of 2.50 (on a 4.00 scale) and a score of at least the 50th percentile on the applicable admission test.

Applicants must submit scores on the Graduate Management Admission Test (GMAT).* It is the responsibility of the applicant to make arrangements

* Applicants for the concentration in Public Administration may substitute scores on the Graduate Record Examination or the Miller Analogies Test.

for the test with the Educational Testing Service, Box 966, Princeton, N.J. 08540.

Applicants whose undergraduate quality-point index is less than 2.50 or whose Graduate Management Admissions Test score ranks beneath the 50th percentile will be considered if (1) the quality-point index multiplied by 200 and added to the GMAT score equals 950 points or (2) the quality-point index for the last two years of undergraduate work multiplied by 200 and added to the GMAT score equals 1,000 points.

Waiver of the admission test may be requested by letter by applicants who meet the following criteria: (1) the undergraduate quality-point index exceeds 3.00, (2) the undergraduate degree was conferred no more than five years previously, and (3) the undergraduate major was a discipline which supports the graduate program for which the application is made. The Admission Office will inform the applicant whether or not a waiver will be granted.

A maximum of one-quarter of the semester hours of graduate course work required for the degree may be approved for transfer to the School of Government and Business Administration from the Division of University Students, the College of General Studies, another degree-granting division of this University or another accredited college or university under the following conditions: the course work must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be graduate-level course work, it must have been taken within the past two years and the student must have received a grade of *B* or better. This action must be approved by a petition to the advisor and the dean. A transcript of the course work must be on file before the petition can be considered. The transfer of credit rule applies to course work taken at this University in nondegree status. The letter of admission will designate a specific semester at the beginning of which degree candidacy commences. Combined transfer credit at that point may not exceed nine semester hours.

The Degrees of Master of Arts in Special Studies or *Master of Science in Special Studies (Graduate School of Arts and Sciences).*—These Master's degree off-campus programs are arranged for groups of students participating in a particular program which has been approved by the Graduate School of Arts and Sciences. Application for Master's degree candidacy must be made by members of the group before registration. Completed application, required credentials, and the application fee should be sent to the Office of the Dean, Graduate School of Arts and Sciences, 2000 H Street, N.W., Washington, D.C. 20052.

Admission to graduate study toward a Master's degree in this School requires a bachelor's degree, from an accredited college or university, with an over-all quality-point index of 3.00 (a *B* average) or an equivalent grade.

A maximum of nine semester hours of advanced standing may be credited toward a Master's degree by transfer of credit for approved graduate course work taken at an accredited college or university or in nondegree status at this University.

The Degrees of Master of Science or *Master of Engineering Administration (School of Engineering and Applied Science).*—Application for Master's degree candidacy *must* be made before registration. Completed application, required credentials, and the application fee should be sent to the Manager of Engineering Admissions, School of Engineering and Applied Science, 725 23rd Street, N.W., Washington, D.C. 20052.

Admission to graduate study toward a Master's degree requires an appropriate bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, as indicated by undergraduate grades, Graduate Record Examination scores, and similar data.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to graduate student status. In some cases, if such deficiencies are minimal, he may be admitted to graduate student status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he is deficient. In no case may the undergraduate courses thus taken fulfill any part of the requirements for the Master's degree.

Students wishing to apply for admission to the program of study leading to the degree of Master of Engineering Administration must meet the following additional admission requirements: (1) the applicant must have an adequate knowledge of the principles of human relations, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, *Introduction to Engineering Administration;* EAd 160, *Introduction to Engineering Economic Analysis;* and EAd 170, *Basic Quantitative Methods for Engineering Administration.* (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. (3) A student is required to earn the grade of *C* or better in these courses (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. A student is not permitted to repeat any of the undergraduate prerequisite courses. Credit for prerequisite courses is not applicable toward the degree of Master of Engineering Administration.

Up to six semester hours of satisfactory credit (with grades of *A* or *B*), which normally must have been earned in a graduate program at another recognized institution, *may* be accepted in transfer, when applicable, to satisfy Master's degree requirements in the School of Engineering and Applied Science. However, the student must, with the approval of the advisor, petition to the appropriate department chairman for such a transfer.

EDUCATION SPECIALIST DEGREE

The Degree of Education Specialist (School of Education).—Each applicant must be interviewed and recommended by a staff member of the School of Education or by a representative in the candidate's locality appointed by the Dean. Admission requires a Master of Arts in Education degree from this University (or the equivalent), a satisfactory score on the Miller Analogies Test or the Graduate Record Examination, or grades in graduate course work which meet standards set by the Advanced Graduate Faculty and two years of successful pertinent experience. Completed application, required credentials, and the application fee should be sent to the Office of the Dean, School of Education, George Washington University, Washington, D.C. 20052.

DOCTOR OF SCIENCE DEGREE

The Degree of Doctor of Science (School of Engineering and Applied Science).—The prospective doctoral student seeking admission should apply before June 1 for the fall semester and before December 1 for the spring semester. Personal interviews may then be arranged to discuss the applicant's qualifications and the possibilities for an effective doctoral program. The applicant must arrange for complete documentary records (transcripts) to be forwarded to the Manager of Engineering Admissions, School of Engineering and Applied Science, 725 23rd Street, N.W., Washington, D.C. 20052, in sufficient time to permit assembly of complete records for evaluation as soon after the above application deadlines as possible.

To be admitted to the doctoral program, a satisfactory master's degree from an accredited institution is required, together with acceptable personal qualities and a capacity for creative scholarship. Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards. The applicant must arrange for letters of recommendation to be submitted from two faculty members of the institution from which the master's degree was received; one of these, if possible, should be from the master's advisor. The letter should be addressed to the appropriate department chairman.

Up to six semester hours of credit earned in courses completed with the grade of *A* or *B* while enrolled in a doctoral program at another accredited institution may be accepted in transfer to satisfy doctoral requirements at this School, subject to the approval of the student's adviser and his department chairman. Credit earned in courses completed more than five years prior to admission to the doctoral program will not be accepted in transfer, and some departments may require that transfer credit must have been earned within a shorter period of time before admission.

READMISSION

A student who withdraws, is suspended, or is otherwise absent from the University for one or more spring or fall semester, must make formal application for readmission. If readmitted, the student is subject to the rules and regulations in force at the time of return. Complete and official transcripts from each institution the student has attended since making the previous application must be sent to the appropriate office at this University before the application for readmission can be evaluated.

When there are curriculum changes in graduate programs in the School of Government and Business Administration, the readmitted student may be required to take additional course work.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time last registered at this University and who have not since registered at another institution.

Registration

OFF-CAMPUS REGISTRATION is conducted before or at the first class meeting of each course, at times and places stated in the *Off-campus Schedule of Classes*, available well in advance of each semester.

Registration in an off-campus course *constitutes admission to that course only*. It does not admit the student to campus courses or to degree candidacy. Only students admitted to degree candidacy may enroll as full-time students (for 12 semester hours or more). Those who have graduated from high school recently and wish to be *full-time freshmen* at this University should apply for admission to the appropriate college or school on campus.

Off-campus degree candidates in an area of concentration with a small enrollment which would not justify offering courses off campus may have to register for campus courses in order to meet the requirements for the degree. *See the* Off-campus Schedule of Classes *for details concerning permission to register for campus courses.*

Auditing.—With the permission of the instructor, students may register as "Auditors." An auditor is not required to take active part or to take examinations; the auditor receives neither grades nor credit. Tuition is the same for the auditor as for the student registered for credit. With the approval of the dean, a student may change from credit to audit status during the first third of the semester. A student who takes a course as an auditor may not repeat it later for credit.

Concurrent Registration.—A student registered as a degree candidate in any other college or school of the University may take credit courses in the College of General Studies *only by permission (granted prior to registration) of the dean* of the college or school concerned. A College of General Studies Off-campus Concurrent Registration Permit form must be obtained from the appropriate college or school, signed by the dean of that college or school, and presented at the time of registration in the College of General Studies.

Any student taking course work in another college or school of the University or at another institution through the Consortium of Universities of the Washington Metropolitan Area, Inc., must have the dean's permission.

Fees and Financial Regulations

ALL FEES should be paid by check or money order, made payable to George Washington University. The student identification number should appear in the upper left-hand corner.

The following fees were adopted for the 1977 summer sessions and academic year 1977–78. (See pages 26–27 for projected tuition and fee increases for 1978–81.)

Tuition*

On campus:	
Part-time undergraduate program, for each semester hour	$105.00
Graduate study other than in the School of Engineering and Applied Science, for each semester hour	105.00
Graduate study in the School of Engineering and Applied Science, for each semester hour	107.00
Off campus:†	
For each semester hour	78.00
School of Engineering and Applied Science off-campus programs, for each semester hour‡	107.00
Thesis:§	
Master of Arts in Education and Master of Science in Administration degree programs (other than ICAF), for each semester hour	105.00
School of Engineering and Applied Science programs, for each semester hour‡	107.00

University Center Fee (charged only to students registered on campus, nonrefundable)

For students registered for 11 or more semester hours on campus:	
For each semester	50.50
For students registered for less than 11 semester hours in a semester on campus:	
For each semester hour for which the student registers	4.75
For on-campus degree candidates maintaining "continuous registration" status:	
For each semester	4.75
Charles E. Smith Center Fee (for off-campus degree candidates only) Students registered as degree candidates in a program offered through the College of General Studies may purchase, on a semester-by-semester basis, a special card entitling them to use the Smith Center facilities for that semester or session. Students must first obtain from CGS a signed certificate attesting to degree candidacy	25.00

Special Fees

Application fee (undergraduate degree candidate), nonrefundable	10.00
Application fee (graduate degree candidate), nonrefundable	25.00
Graduation fee, due and payable at the time of registration for the last semester or summer session:	
Associate's degree	10.00
Bachelor's, Master's, and Doctor of Science degrees	25.00

*Students interested in full-time undergraduate study on campus should consult the appropriate catalogue (*Undergraduate and Graduate, School of Engineering and Applied Science*, or *School of Business and Health Sciences Programs*).

†This fee does not apply to special off-campus programs arranged with the School of Engineering and Applied Science.

‡Payment of tuition for a Master's thesis entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. If the thesis is unfinished, additional time may be granted in accordance with the regulations of the school in which the student is registered. (See page 37 for regulations governing military leave.)

Special Columbian College of Arts and Sciences departmental examination fee, for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	$25.00
Continuous Registration fee, *off-campus degree candidates (other than those in the School of Engineering and Applied Science)*, to maintain "continuous registration" during any semester of absence from the University*	78.00
Continuous Registration fee, *on-campus or off-campus,† degree candidates in the School of Engineering and Applied Science*, to maintain "continuous registration" during any semester of absence from the University or after completion of tuition requirements*	107.00
Late-registration fee, for failure to register for campus courses within the designated period	15.00 10.00
Fee for binding two copies of the Master's thesis	60.00
Fee for Microfilm Service and Printing Announcement of Final Examination (Doctor of Science candidates)	15.00
Late-payment fee, for failure to make payments when due (see "Payment of Fees," pages 27–29)	35.00
On-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," pages 27–29)	15.00
Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," pages 27–29)	15.00 5.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, returned by the bank for insufficient funds, or returned for any other reason	2.00
Fee for each examination to waive a curriculum requirement	.50
Transcript fee, for each transcript of record If two or more transcripts are requested at the same time, fee for each of the first two copies is $2.00 each, fee for each additional copy	2.00
Replacement of lost or stolen picture identification card	

PROJECTED TUITION AND FEE INCREASES 1978–81

Projected increases for the academic years 1978–79, 1979–80, and 1980–81 have been estimated as follows:

* Payment of the continuous registration fee entitles the student who is granted leave of absence to return and continue his work toward a degree under the academic requirements which were in force at the time of his first registration. The continuous registration fee applies toward neither tuition fee nor residence requirements for the degree. This fee does not apply to students granted military leave (see page 37).

† This fee does not apply to special off-campus programs arranged with the School of Engineering and Applied Science.

On Campus*

*Increase by semester hour (graduate and part-time undergraduate students):

1978–79	$5.00
1979–80	5.00
1980–81	7.00

Off Campus

*Increase by semester hour (except School of Engineering and Applied Science programs):

Course Work Other Than Thesis:

1978–79	4.00
1979–80	5.00
1980–81	5.00

Thesis for Master of Arts in Education and *Master of Science in Administration programs:*

1978–79	5.00
1979–80	5.00
1980–81	7.00

†Increase by semester hour (School of Engineering and Applied Science programs including thesis):

1978–79	5.00
1979–80	5.00
1980–81	7.00

PROJECTED TUITION AND FEE INCREASES

It is not possible to project future economic data with certainty. The increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

PAYMENT OF FEES

OFF-CAMPUS COURSES

Fees for each semester are due and payable in full at the time of each registration; however, a student registering for a *13-week or longer credit course* may sign a deferred payment contract at each registration to make payments in three equal installments—one-third at the time of registration, one-third by

*Students interested in full-time undergraduate study on campus should consult the appropriate catalogue (*Undergraduate and Graduate, School of Engineering and Applied Science,* or *School of Medicine and Health Sciences Programs*).

†Semester-hour increases become effective at the beginning of the summer sessions preceding the academic year.

‡This increase by semester hour does not include the projected increases for special off-campus programs arranged with the School of Engineering and Applied Science.

October 4, 1977, and one-third by November 4, 1977 (for the fall semester); one-third by February 10, 1978, and one-third by March 10, 1978 (for the spring semester). Payments are due at the stipulated times. Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the beginning of each semester to the date payment is made.

Students receiving partial government tuition assistance must pay their portion of the tuition in full at the time of registration.

Except for specified special sessions, tuition and fees for credit courses lasting less than 13 weeks, and for all noncredit courses, are payable in full at registration.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to an interest charge of 8 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits his rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $15.

Students auditing courses are subject to all fees charged to students registered for credit.

CAMPUS COURSES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University. All financial credit is made by student number. It is therefore essential that the student identification number appear in the upper left-hand corner of the check.

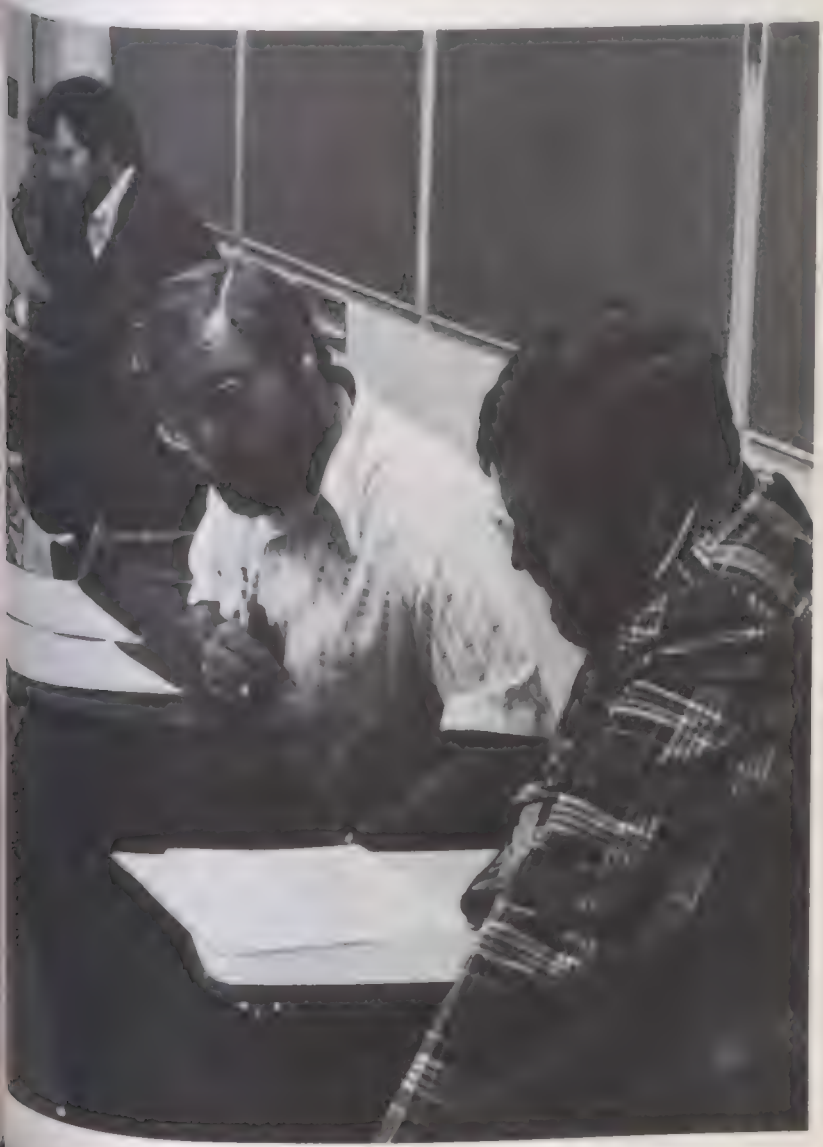
The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before October 26, 1977 (for the fall semester) and March 8, 1978 (for the spring semester). Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $600 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 per cent per annum. Accounts which become 30 days past due will be finan-

ially encumbered. In the event a student's account is financially encumbered, he student forfeits rights to the use of deferred payment contracts in fu- re semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settle- ment will require payment in full of all amounts due to the University in ad- dition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students regis- ered for credit.



REFUND OF FEES FOR OFF-CAMPUS REGISTRATION*

Applications for withdrawal from a course or for change in class schedule must be made in writing. Notification to an instructor is not an acceptable notice (see "Changes in Program of Studies," pages 35–36).

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges will be made in accordance with the following schedule for the academic year:

REFUND SCHEDULE 1977–1978

Long Session (or any session longer than 13 weeks)

90% Starting date of class plus 6 calendar days
75% Starting date of class plus 20 calendar days
50% Starting date of class plus 34 calendar days
0% Starting date of class plus 35 calendar days to end

Short Session (7 weeks, 2 days per week)

90% Starting date of class plus 2 calendar days
75% Starting date of class plus 8 calendar days
50% Starting date of class plus 15 calendar days
0% Starting date of class plus 16 calendar days to end

Mini Session (3 weeks)

90% Starting date of class plus 1 calendar day
75% Starting date of class plus 5 calendar days
50% Starting date of class plus 9 calendar days
0% Starting date of class plus 10 calendar days to end

No refund will be awarded for sessions of less than 21 days.

No exceptions will be made for holidays, late registration, absences, or class rescheduling for any reason whatsoever.

A student who is granted military leave before completing the semester will receive credit for current charges in accordance with the schedule for withdrawals from the University (see above). Payments made in excess of the nonrefundable balance will be refunded to the student. The nonrefundable balance will be maintained as a deferred credit for use by the student when he returns to the University (see "Military Leave," page 37).

In no case will tuition be reduced or refunded because of absence from classes.

Payment applies only to the semester for which a registration charge is in-

* For regulations concerning refunds of fees for students who register for courses on campus, see the appropriate Catalogue (*Undergraduate and Graduate, the School of Engineering and Applied Science* or *Summer Sessions Programs*).

curred and will not be credited to another semester (exception: students granted military leave, see page 37).

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Regulations

CAMPUS STUDY

OFF-CAMPUS DEGREE CANDIDATES may register for campus courses approved for their programs if these courses are not available at off-campus centers. Columbian College degree candidates must notify the Office of Student Records, College of General Studies, telephone 676-7017, at least two weeks prior to the date of campus registration. School of Education degree candidates call 676-6160 eight weeks in advance of campus registration. Other off-campus degree candidates should call the appropriate school two weeks in advance as follows: School of Government and Business Administration undergraduate students call 676-7027; School of Government and Business Administration graduate students call 676-6584; and School of Engineering and Applied Science students call 676-6158. Registration materials may be picked up by the students at building K, 817 23rd St., N.W., during registration.

A student may register for on-campus courses as a nondegree student in the Division of University Students, telephone 676-6370.

ACADEMIC WORKLOAD

Only students admitted to degree candidacy may enroll as full-time students, or for 12 or more hours in a semester. Students taking course work to qualify for degree candidacy who are registered in this College may not take more than 10 hours in a semester.

A full-time undergraduate student in Columbian College of Arts and Sciences who is not on probation may not ordinarily take more than 17 semester hours. A student employed more than 20 hours a week, who is not on probation, may not take more than 10 hours.

A full-time undergraduate student in the School of Government and Business Administration who is not on probation may not ordinarily take more than 15 semester hours. A student employed more than 24 hours a week, who is not on probation, may not take more than nine semester hours.

A full-time undergraduate student who is a candidate for a degree in the School of Government and Business Administration and whose quality-point index is 3.50 or higher may take up to 18 hours. An employed undergraduate student who meets the same standard may take up to 12 semester hours.

A full-time undergraduate student who is a candidate for a degree in Columbian College of Arts and Sciences and who, during the immediately preceding semester, has received no grades below *B* and has earned grades of *A* in three courses totaling at least nine semester hours may take 18 or 19 hours. An employed undergraduate student who, during the immediately preceding semester, has no grades below *B* and has earned grades of *A* in two courses totaling at least six semester hours may take 12 hours.

A student on probation normally may not take more than three semester hours.

A student who accepts employment after registration or at any time during a semester must report that fact immediately to the dean so that the program may be adjusted, if necessary.

A full-time graduate student who is a candidate for a degree in the School of Government and Business Administration is normally expected to register for nine to 12 semester hours each semester. A graduate student who is employed more than 20 hours a week may not take more than six hours.

A full-time student in the Graduate School of Arts and Sciences registers for nine to 12 semester hours each semester; a part-time student must register for six semester hours each semester. These requirements do not apply when a student has fewer than nine semester hours (full-time) or six semester hours (part-time) remaining to complete the program. No more than 15 semester hours during any one semester.

ATTENDANCE

Students may not attend classes until registration is completed and fees due are paid. Students may attend only those classes for which they are registered. Regular attendance is expected. Students may be dropped from any course for undue absence.

SCHOLARSHIP

GRADES

Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors or the administrative staff.

UNDERGRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; *CR*, Credit; *NC*, No Credit. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which the student has received a grade of *D* or better, unless required to do so by the department concerned. A written statement to this effect must be submitted to the Registrar by the appropriate departmental chairman.

GRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *CR*, Credit; *W*, Authorized Withdrawal. Except for courses which specifically state that repetition for credit is permitted, a student taking School of Education and School of Government and Business Administration courses may not repeat for credit a course in which the student

has received a grade of *C* or above. A student taking a Graduate School of Arts and Sciences course may repeat for credit a course in which the student has received a grade of C or above only when permitted to do so by the department concerned, unless the course description states that the course may be repeated for credit. A written statement to this effect must be submitted for approval to the dean's office. It is then filed with the Registrar. A student taking School of Engineering and Applied Science courses may not repeat for credit a course in which a grade of *C* or above has been received, unless required to do so by the department concerned; a written statement requiring the student to repeat such a course for credit must be submitted to the Registrar by the appropriate department chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Whenever a grade has not been assigned, the symbol *I* (Incomplete), the symbol *W* (Authorized Withdrawal) or the symbol *F* (Unauthorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, the instructor may initiate an appropriate grade change.

REMOVING AN INCOMPLETE

For information concerning the removal of a grade of *Incomplete* from a student's record, consult the regulations of the college or school (see pages 47, 55, 68, 70, 79–80).

THE QUALITY-POINT INDEX*

Scholarship is computed in terms of the quality-point index. This is done by dividing the total number of quality points by the total number of semester hours for which the student has registered. Quality points are computed from grades as follows: for each semester hour of the letter grade—*A*, 4 points; *B*, 3 points; *C*, 2 points; *D*, 1 point; *F*, no points. Example: if a student received an *A* in one three-credit course, and a *B* in another three-credit course, he would compute his quality-point index this way:

$$\begin{aligned} A &= 4 \times 3 \text{ (semester hours)} = 12 \\ B &= 3 \times 3 \text{ (semester hours)} = 9 \\ & \quad 6 \qquad\qquad\qquad 21 \div 6 = 3.5 \text{ quality-point index} \end{aligned}$$

*Not applicable to Columbian College or to graduate study in the School of Engineering and Applied Science.

Courses marked *W, I, CR, or NC* are not considered in determining the index, except that courses marked *I* will be considered after a formal grade is recorded. Grades in courses taken at other institutions are not considered in computing the quality-point index.

WARNINGS*

At stated intervals during the academic year, students who are doing work of *D* grade or lower in courses with departmental numbers below 100 receive "warnings." A "warning" constitutes notice to the student that he or she must consult the instructor and the advisor at the earliest opportunity. "Warning periods" are established during the seventh and eighth weeks of 13-week courses, and during the third and fourth weeks of six and a half week courses.

PROBATION

Undergraduate Probation in the School of Government and Business Administration.—A student whose cumulative quality-point index falls below 2.00 after completing a minimum of 12 semester hours of study will be placed on probation. This probation extends over the period in which the student attempts 12 semester hours of work, which may include remedial studies as prescribed.

Undergraduate Probation in Columbian College of Arts and Sciences.—A student who in one semester receives two grades of *F* in courses carrying three or more semester hours of credit each, or the equivalent, is placed on probation. A student in the first semester on probation who receives one grade of *F* in such a course will be considered on probation for a second semester. Two grades of *D* will be treated as equivalent to one grade of *F* in determining probation. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed. A student on probation taking 12 or more semester hours whose grades are all *C* or better is removed from probation.

Graduate Probation in the School of Government and Business Administration.—A student whose quality-point index falls below 3.00 after completing a minimum of 12 semester hours of graduate study will be placed on probation. This probation extends through the period in which the student next attempts 12 semester hours of graduate work, including prescribed courses. During this period the student's performance will be monitored to determined suitability for continued graduate study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of *F* is required to present cause for consideration by the dean, as to why continued study should be permitted.

SUSPENSION

Undergraduate Suspension in the School of Government and Business Administration.—A student whose quality-point index is 1.50 or below or whose index remains below 2.00 at the end of the probationary period may be suspended. A student suspended for poor scholarship may apply for readmission

* Not applicable to the School of Government and Business Administration.

after the lapse of either the fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. A student readmitted after suspension is on probation and must maintain a current quality-point index of at least 2.50 on each 12 semester hours of work undertaken until the cumulative index is 2.00. In no case will the probationary period after readmission exceed 24 hours of study. A student suspended twice for poor scholarship will not be readmitted.

Undergraduate Suspension in Columbian College of Arts and Sciences.—The following three cases constitute ground for suspension: (1) three grades of *F** in courses carrying three or more semester hours of credit or the equivalent; (2) two grades of *F* when on probation; (3) one grade of *F* when in a second semester of probation. Two grades of *D* will be treated as equivalent to one grade of *F* in determining suspension. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed.

A student who is subject to probation for the third time, whether successive or after an interval, is suspended.

A student suspended for poor scholarship cannot register for courses even as an auditor. A student may apply for readmission after the lapse of either the fall or the spring semester. The student must then submit evidence to the Committee on Scholarship that he or she is better qualified to pursue college work. A student suspended twice for poor scholarship will not be readmitted.

Graduate Suspension in the School of Education.—A student who receives the grade of *C* in more than six semester hours of work is subject to suspension. A student who receives a grade of *F* must confer with the dean before enrollment for further work.

Graduate Suspension in the School of Government and Business Administration.—A graduate student who does not meet the conditions of probation (see above) will be suspended or asked to withdraw. A student who is suspended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence which indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of graduate study. Should the student fail to achieve this minimum quality-point index, a second suspension will result and subsequent readmission will be denied.

CHANGES IN PROGRAM OF STUDIES

DROPPING A COURSE OFF CAMPUS

A course may be dropped without academic penalty during the first third of the semester (first through third class meeting in the School of Government and Business Administration; first through fourth class meeting in all other schools). Withdrawing from a course without academic penalty after this

*The rules governing probation and suspension are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester. Students enrolled for less than 12 semester hours during the fall or spring semester and students enrolled during the summer sessions are subject to probation or suspension on the basis of their record for 12 semester hours, or multiples thereof, rather than on their record in any one semester.

period requires approval of a written request, *accompanied by a completed drop slip,* addressed to the Dean of the College of General Studies.

Procedure for Dropping Courses.—An off-campus drop slip (obtainable from the instructor or from the College of General Studies) must be completed, signed, and dated by the instructor, and submitted to the College of General Studies. The instructor will indicate on the drop slip whether or not the student is passing. Merely reporting a withdrawal to an instructor does not effect official withdrawal from a course. The effective date of withdrawal will be the date the instructor signed the drop slip.

Failure to follow the proper procedure will result in the Office of the Registrar recording the grade of *F* and, regardless of the time of discontinuance, will not relieve the student of financial responsibility for the entire course.

DROPPING A COURSE ON CAMPUS

A *campus* drop slip (available at the Office of the Registrar) must be completed, signed, and dated by the instructor and submitted as follows: Columbian College degree candidates submit theirs to the Office of Counseling and Student Services, College of General Studies. All other degree candidates submit their campus drop slips to the appropriate dean.

Each college, school, and division of the University sets deadline dates for each semester concerning withdrawal. Withdrawal between these dates and the end of the semester is permitted only in exceptional circumstances.

All charges for courses dropped without the approval of the dean must be met by the student. Reporting the dropping of a course to an instructor does not constitute an official withdrawal.

TRANSFER WITHIN THE UNIVERSITY

Transfer from one college, school, or division of the University to another may be made only with the approval of the deans concerned. Applications for transfer are available at the University's Office of Admissions or at the office of the appropriate dean. Upon transfer the student should consult his or her faculty advisor as to the requirements that must be fulfilled.

A maximum of 42 semester hours is transferable toward the Associate in Arts in General Studies degree; a maximum of 90 semester hours is transferable toward a Bachelor's degree; a maximum of nine semester hours is transferable toward a Master of Science in Administration degree; and a maximum of nine semester hours is transferable toward the degree of Master of Arts in Special Studies, Master of Science in Forensic Science, or Master of Science in Special Studies. Students transferring within the University are advised to note the residence requirements of the degree sought.

CREDIT

Credit toward a degree is given only after registration for and satisfactory completion of the required course work, or upon the granting of advanced standing in accordance with the regulations of the College.

For transfer from credit to audit status, see page 24.

BALANCE SHEET

On request, Office of the Registrar will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet will be issued only in the event the student changes major or degree objectives.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript.

CONTINUOUS REGISTRATION

Degree candidates are expected to maintain continuous registration until *all* degree requirements are satisfied (for "Leave of Absence" exception granted by the Graduate School of Arts and Sciences, see page 68). Students who have completed course requirements (including the thesis) must maintain continuous registration by paying the "continuous registration" fee (see page 26). By failing to register for one semester or more, the student breaks registration and must be readmitted (see "Readmission," page 23). A readmitted student is subject to the regulations and requirements in force at the time of readmission.

Students must be registered during the summer if they are taking courses, are taking required examinations, are receiving guidance toward theses or dissertations, or are expecting to graduate at the end of the Summer Sessions.

MILITARY LEAVE

A student called to active duty may be granted military leave for the period of active duty, upon presentation to the dean of a copy of the military orders and a petition for such leave. The maintenance of "continuous registration" is not required of the student on military leave; however, the student must apply for readmission to the University well in advance of the semester of expected return. Payments for tuition and fees which are not refunded to the student at the time the military leave is granted will be maintained as a deferred credit for the student's account and used upon return to the University.

GRADUATION REQUIREMENTS

Degrees are conferred in February, May, and September.

To be recommended for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the

degree for which registered; and be free from all indebtedness to the University. Registration, either for course work or on the "continuous registration" fee basis, is required for the semester or summer session at the close of which the degree is to be conferred. A letter concerning degree completion is sent to military files upon request.

Application for Graduation.—An "Application for Graduation" form *must* be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship.—The student must meet the scholarship requirements for the particular degree for which he is registered.

Curriculum.—See the requirements for the degree concerned.

Residence.—A student is "in residence" only when registered for course work after filing formal application for degree candidacy or for the 15 semester hours undertaken to qualify for degree candidacy (see the specific residence requirements for the degree concerned).

With the permission of the appropriate dean, a student may be granted leave of absence; such student should, however, remain technically in residence by paying the continuous registration fee for each semester he is absent (for exception granted by the Graduate School of Arts and Sciences, see page 68). For the purpose of this regulation, the summer session is disregarded.

Except for Master's degree candidates in the Graduate School of Arts and Sciences, the School of Education, and the School of Engineering and Applied Science, service personnel who receive military transfers when they are within six hours of a degree may, by special arrangements, be permitted to complete their work elsewhere, transfer these credits to the appropriate school or college, and receive a degree from the University. This procedure does not apply to Master's candidates who have been granted six hours of transferred credit or have not completed the required courses.

Attendance and Conduct.—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

*Thesis.**—A thesis, submitted in partial satisfaction of requirements for the Master's degree, must be submitted in its final form to the appropriate dean no later than the date specified in the calendar. Two complete copies of the thesis are required. It is the responsibility of the candidate to obtain form the appropriate degree-granting school a printed copy of the regulations governing the styling and reproduction of the thesis. These regulations are rigidly enforced (see page 70).

Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

Dissertation.—A dissertation, submitted in partial satisfaction of requirements for the Doctor of Science degree, must be submitted in its final form to the appropriate department of the School of Engineering and Applied Science

* Applicable only to programs in the School of Government and Business Administration. See page 80 for *Thesis* in the School of Engineering and Applied Sciences, pages 65-66 for *Thesis* in the School of Education.

no later than the date specified in the Calendar. It is the responsibility of the candidate to obtain a printed copy of the regulations governing the styling and reproduction of the dissertation (see page 82).

HONORS

Dean's List.—To be eligible for inclusion on the Dean's List, a student must be a candidate for an undergraduate degree in Columbian College of Arts and Sciences or the School of Government and Business Administration. Course work taken while the application for admission is being processed will be computed in determining eligibility for the Dean's List. In the School of Government and Business Administration, the names of students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term. In Columbian College of Arts and Sciences degree programs, a student must have received grades of *A* in at least 60 per cent of the last 15 semester hours of work and no grades below *B* for that semester.

With Distinction.—The undergraduate degrees may be conferred "With Distinction," at the discretion of the Dean's Council of the College and the Committee on Scholarship if a student meets the following qualifications: in the School of Government and Business Administration the student must attain a quality-point index of 3.50 or higher on all work taken at this University, or in Columbian College of Arts and Sciences programs the student must have received grades of *A* in at least 60 per cent of the courses taken at this University.

To be eligible a student must have completed at this institution at least one-half of the course work required for the degree.

Special Honors.—Special Honors may be awarded to any member of the graduating class for outstanding achievement in the student's major field upon recommendation of the major department. The student must fulfill the following requirements:

1. Candidacy for Special Honors must be approved by the faculty member representing the major department or field not later than the beginning of the senior year.
2. Such other conditions as may be set at the time candidacy is approved must be met.
3. At least one-half of the courses required for the degree must have been completed at GW.
4. The specific requirement of the college or school in which registered, must be fulfilled as follows: (a) Columbian College of Arts and Sciences—attainment of the grades of *A* or *B* in 50 per cent of the courses taken at this institution; or (b) the School of Education or the School of Government and Business Administration—maintain a quality-point index of at least 3.00 in all course work taken at GW.

Note: A student may receive the Associate in Arts degree "With Distinction" if the student has taken at this institution at least one-half of the courses re-

quired for the degree and has received the grade of *A* in at least 60 per cent of these courses. The student may receive the degree "With Special Honors" if at least one-half of the courses required for the degree have been taken at GW and the grades of *A* or *B* have been received in 50 per cent of these courses.

DISHONESTY

The University community, in order to fulfill its purposes, must establish and maintain guidelines for academic behavior. Members of the Community are expected to exhibit honesty and competence in their academic work.

Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper university channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

THE LIBRARY

A student registered in the College of General Studies is entitled to the use of the University Library. Its stacks are open, and all students are welcome to browse at their leisure. A permit form for library privileges is issued to each student. A borrower's card may be obtained by presenting the permit form at the circulation desk of the Library.

The loan period for stack books is 14 days. A fine of 25 cents is charged for each day a book is overdue. Any book which circulates is subject to recall by

the Library if needed for reserve or other use. Most reserve material must be used in the reserve reading room. Students should check with the desk for regulations regarding overnight use. A fine of 50 cents is charged for each hour or fraction thereof that reserve material is overdue. Grades of a student are withheld until his library record is clear.

All students using the University Library are expected to be familiar with its detailed regulations, available at any of the Library's service desks.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

UNIVERSITY POLICY ON RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: address; telephone number; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; and honors received. A student who does not wish such directory information released must give written notice to this effect in the Office of the Registrar.

University guidelines on the release of student information may be obtained from the Office of the Registrar.

Student Services

HONOR SOCIETIES

Alpha Sigma Lambda.—A national honor society for part-time evening college and off-campus undergraduate degree students, the purpose of which is to recognize and encourage scholarship and leadership among undergraduate degree candidates. Membership is limited to students who have been enrolled for four semesters or terms in the College of General Studies and have completed 30 semester hours of work toward a degree with a 3.50 average, or equivalent. The Alpha Alpha Chapter was established at George Washington University in 1965.

Phi Beta Kappa.—Undergraduate degree candidates in the College of General Studies programs are eligible for membership in Phi Beta Kappa, a national scholarship honorary society. The society recognizes "outstanding intellectual capacity well employed" in the field of liberal arts and sciences. Senior and junior students who are candidates for the degree of Bachelor of Arts, Bachelor of Science, or Bachelor of General Studies in Columbian College, and who have shown broad cultural interests, distinguished scholarly achievement, high character, general promise, and scholarly ideals may, to a number not exceeding 15 per cent of a class, be elected to membership by the faculty members of the Alpha Chapter of the District of Columbia. Seniors and juniors in other schools of the University who meet the above requirements are also eligible for consideration for membership, provided that their program of studies includes appreciable work in the liberal arts.

COUNSELING

Students in the off-campus programs may obtain educational counseling and assistance in program planning through the Office of Counseling and Student Services or from University representatives at the various off-campus centers. The Office of Counseling and Student Services coordinates student personnel services, including adult academic counseling, vocational guidance as related to educational programs, and liaison with other University departments and services, as well as serving as a resource center for information on tuition assistance available to students in the College of General Studies programs. Appointments may be made by calling the College of General Studies, telephone 676-7000, or through the Education Director at locations where courses are scheduled. University counselors are also available at all locations during announced registration periods and at scheduled times each month.

UNIVERSITY BOOKSTORE

Textbooks may be ordered by mail from the University Bookstore. Forms for this purpose are available at registration. The hours of the Bookstore will be announced in the *Schedule of Classes.*

The Bookstore is located in the Cloyd Heck Marvin Center, 800 21st Street, N.W.; telephone 676-6870.

VETERANS EDUCATION

The veterans counselor in the Office of the Registrar, Luther Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as veterans, widows, or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. New applications for Veterans Administration educational benefits and requests to transfer benefits to GWU should be processed through the veterans counselor and not directly to the Veterans Administration.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

STUDENT AND ALUMNI CAREER SERVICES OFFICE

The Career Services Office provides career guidance and placement to GW students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills, a full library of literature on occupations and employers, and current information on government employment including testing dates and application forms. Seniors and alumni may also use the office to establish credential files for application to graduate schools and for employment. The office is open from 9 a.m. to 5 p.m. Monday through Friday, with evening hours scheduled during each semester. It is located at Woodhull House, 2033 G St., N.W.

Continuing Education for Women Center

The Continuing Education for Women Center offers programs for women (men, too, are invited to participate) who wish to resume their education on a part-time basis. Opportunities are provided for education, preparing for new careers, qualifying for job-promotion, furthering and participating more effectively in community affairs, and enriching personal lives. Further information, including descriptive brochures, may be obtained by calling 676-7036 or writing to the Continuing Education for Women Center, George Washington University, 2130 H Street, N.W., Washington, D.C. 20052.

The Center offers (1) group and individual counseling services both day and evening; (2) off-campus credit courses at convenient hours and locations; (3) seminars and non-credit courses; (4) certificate programs; (5) academic advising for those entering degree and nondegree programs; and (6) specially designed courses and workshops for business and government agencies.

GROUP COUNSELING SERVICES

Developing New Horizons/Career Development-Life Planning, a 14-session program, enables participants to gain confidence and direction. They acquire self-understanding through introspective and experiential exercises and standardized tests; set priorities; learn effective job-finding skills; assess career outlook; examine educational opportunities; and explore appropriate career and personal options.

Career Planning for Young Adults is designed to meet the special needs of students in their last two years of high school or first two years of college. They are offered assistance in exploring career opportunities, choosing an appropriate curriculum, developing effective study skills, learning job-finding techniques, and setting immediate and future goals.

Developing New Horizons for International Women offers women from other countries an opportunity to become culturally oriented to the U.S. and to the ways of developing and utilizing their talents.

Single Again helps formerly married persons to make emotional and social adjustments and gain legal and financial information.

Single Parenting gives special assistance in coping with the child's feelings and difficulties and in attaining personal and financial stability.

Creative Retirement assists in planning for another full-time career, part-time employment, volunteer activities, or leisure interests.

Dynamic Aging explores the aging process from a personal perspective; psychological, physical, and social aspects will be considered.

The Multi-generational Family addresses the problems which arise when grandparents, parents, and children live in one household and emphasizes ways of recognizing the rights and responsibilities of each.

Groups are scheduled for day and evening hours on weekdays and Saturdays in selected locations in D.C., Maryland, and Virginia. Individual counseling is a part of all group counseling.

INDIVIDUAL CAREER COUNSELING

This program is by appointment only and is conducted on a one-to-one basis. Individual Career Counseling includes a battery of tests, independent study, and conferences with the counselor.

ACADEMIC ADVISING

The professional staff of the Continuing Education for Women Center advises women interested in enrolling in off-campus degree and nondegree programs. Counselors are available at dates and locations indicated for registration. Appointments can also be made for periodic advising sessions at the Office of Continuing Education for Women Center, 2130 H Street, N.W., Washington, D.C. 20052.

DAYTIME OFF-CAMPUS CREDIT COURSES

To enable women to continue their formal education, the Continuing Education for Women Center offers credit courses off campus at convenient hours and locations. Classroom space has been provided by churches and community centers in Alexandria, Arlington, Annandale, Falls Church, McLean, and

Springfield, Va.; Bethesda, Chevy Chase, Kensington, and Rockville, Md.; as well as the District of Columbia.

Except for Education courses, which meet for 3 hours a week, each undergraduate course meets once a week for 2½ hours during the morning, afternoon, or evening. Although many take these courses to meet requirements for degree programs, students may also be accepted in a nondegree status. Those who complete credit courses as nondegree students are encouraged to apply for degree candidacy at George Washington University. Some need only specific courses to qualify for positions in business or government; others who already have degrees wish to qualify for professional certification. Many students in the program have had credits transferred to other colleges and universities throughout the country.

Government and industry have been granting leave for employees to enroll in daytime credit courses, particularly when the courses are job-related.

NONCREDIT COURSES

Selected noncredit courses and seminars, taught by academically qualified instructors, are offered through the Continuing Education for Women Center. Offerings include *Introduction to Library Science; Writing and Illustrating Children's Books; Starting Your Own Business; How to Study; Mathematics Refresher; Write to Sell; Conference Planning; CLEP Review; Introduction to Landscape Architecture; Current Mental Health Practices; Writing Fiction; Masters of American Art; Law School Admission Test Review; Dynamic Communication; Nutrition and Mental Health; Time Management; How to Get More Grants; 20th Century Artists and Their Techniques; Be an Effective Manager/Leader; Poetry Workshops.*

Career Certificate Programs

LEGAL ASSISTANT PROGRAM

During the fall of 1972, the Continuing Education for Women Center, in cooperation with the George Washington University National Law Center, initiated the Legal Assistant Program. This one-year graduate-level academic program prepares men and women to assist lawyers in research, writing, and other out-of-court functions. The program is offered both in D.C. and in Northern Virginia. For admission to the program, an applicant must have a bachelor's degree or the equivalent in education or experience and must successfully complete required tests.

LANDSCAPE ARCHITECT ASSISTANT PROGRAM

A 12-month certificate program in landscape and environmental design was initiated during the spring of 1974. This program concentrates on drafting and design, and includes a survey of plant materials as well as lectures on the varied aspects of the professional's work. Projects in residential, recreational, and urban design are studied along with construction details and graphic rendering of plans. Classes are open to both men and women and are taught by professional landscape architects and horticulturists. A college degree is desirable but not required; however, applicants must successfully complete required tests.

PUBLICATION SPECIALIST PROGRAM

A one-year, graduate-level certificate program in editorial and publishing procedures began in January 1974. The program provides men and women with the practical skills needed for careers in the publications field. The main areas of study are (1) editing and copywriting; (2) printing, layout, and design; and (3) public affairs information. For admission to the program, an applicant must have a bachelor's degree or the equivalent in education or experience and must successfully complete required tests. Post-certificate courses in advanced publishing are offered to graduates and professionals in the field.

MANAGEMENT SPECIALIST PROGRAMS

Two one-year certificate programs in administration and supervision are designed for persons preparing to advance in their current positions. These programs also incorporate college credits that may be used towards an academic degree or may serve as prerequisites for further study. A core group of credit courses and professional development seminars constitute these programs. They are offered two evenings a week plus two Saturdays each semester.

Workshops and Courses On Site—Government and Business

The Continuing Education for Women Center designs programs for Federal agencies and private businesses. These programs are intended to develop competence and aid in upward mobility, and will vary from short workshops to complete courses.



DEGREE PROGRAMS

Undergraduate Degrees

THE FACULTY of Columbian College of Arts and Sciences has academic jurisdiction over the degrees of Associate in Arts in General Studies; Associate in Science in Cartographic Science; Associate in Science in Geodesy; Bachelor of General Studies with areas of concentration in economics, history, law enforcement, mathematics, political science, psychology, and sociology; Bachelor of Science in Cartographic Science; Bachelor of Science in Geodesy; and Bachelor of Science in Oceanography. The faculty of the School of Government and Business Administration has academic jurisdiction over the degree of Bachelor of Science in Administration with areas of concentration in accounting and business administration. These off-campus programs are administered by the College of General Studies.

ADMISSION

For detailed information see "Admission as a Degree Candidate," page 17, and "Graduate Degree Candidacy," page 20.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 33.

Removing an Incomplete.—In Columbian College of Arts and Sciences and the School of Government and Business Administration the grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the appropriate dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

REQUIREMENTS FOR THE ASSOCIATE IN ARTS IN GENERAL STUDIES DEGREE

RESIDENCE

The last 18 semester hours in the Associate in Arts in General Studies degree program must be completed in residence as a candidate for this degree. A portion of the academic work taken to qualify for degree candidacy (see page 17) may be accepted in partial satisfaction of the residence requirement, if the courses are approved as part of the student's degree program.

REQUIREMENTS FOR THE BACHELOR'S DEGREES

RESIDENCE

The last 30 semester hours, including at least 12 hours in the area of concentration, must be completed in residence as a candidate for the degree sought, unless special permission is granted by the appropriate dean to take work elsewhere. This requirement applies to students transferring within the University as well as to students transferring from other institutions. The 15 hours taken in order to be considered for degree candidacy may be counted in residence. For regulations governing military students who are transferred when they are within six semester hours of their degrees, see page 38.

Transfer students to the School of Government and Business Administration who have 90 semester hours of approved transfer credits from another college or university and who need only the 30-semester-hour minimum to complete degree requirements *must* plan their program of study with a faculty advisor before registering for the first course.

In no case will credit for more than 15 semester hours of undergraduate course work taken as a nonmatriculated student at this University be allowed toward meeting degree requirements without prior admission as a degree candidate for the Bachelor of Science in Administration program.

Transfers.—Transfer students from other colleges or universities must complete satisfactorily at least 12 semester hours of the required work in their area of concentration in residence as a candidate for the degree sought.

PROFESSIONAL COURSES

No more than 12 hours of professional courses, e.g., courses offered in units of the University other than Columbian College, may be included in the hours required for the bachelor's degrees in Columbian College. Students electing professional courses under this rule must obtain the approval of the Dean before registration.

USE OF CORRECT ENGLISH

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the appropriate Dean. The Dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the Dean.

ASSOCIATE IN ARTS IN GENERAL STUDIES

Faculty Advisor: John H. McCalla, College of General Studies; Building F, Room 14 Telephone 676-7016.

Upon the satisfactory completion of the requirements set by Columbian College of Arts and Sciences, the degree of Associate in Arts in General Studies is conferred. Students who plan to continue working toward an off-campus Bachelor's degree offered by Columbian College must apply to the Dean upon completion of the requirements for the degree of Associate in Arts in General Studies. Forms for this purpose are available at the College of General Studies.

After completing the requirements for the degree of Associate in Arts in General Studies, students may wish to transfer to an on-campus degree program within the University, or they may wish to transfer to another institution. However, modifications in admission, advanced standing, and curriculum requirements permitted in the Associate in Arts in General Studies degree program may not be accepted in transfer. Therefore, while registered for this degree, students should meet the requirements of the college, school, or university to which they wish to transfer. The entrance requirements of the colleges and schools of the University are stated in this catalogue and in the *Undergraduate and Graduate Bulletin* of the University.

Scholarship.—The system of grading is described on pages 32–34. For regulations concerning probation, suspension, and readmission, see pages 34–35.

CURRICULUM

The satisfactory completion of 60 semester hours of college work in the following curriculum is required. Students who plan to pursue a Bachelor's degree are advised to plan their Associate's program so that they will satisfy the prerequisites to the degree of their choice.

	Semester Hours
Communications	
Engl 9 or 10, 11	6
SpDr 1, 11, 111, or 121	3
Humanities	
Nine semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; Mus 3, 4; Phil 50; Rel 9, 10, 59, 60	9
Natural and Mathematical Sciences	
Three courses selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, 3, 4; Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Ocea 101, 102, 103–4; Phys 1, 2, 3, 4, 9–10; Stat 51, 101–2	9–12
Social Studies	
Nine semester hours are required, each course chosen from one of two departments, selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40, 71–72; PSc 1 or 3, 2; Psyc 1, 8, 22, 29; Soc 1, 2	9
Elective	21–24
Total	60

BACHELOR OF GENERAL STUDIES

Faculty Advisor: John H. McCalla, College of General Studies; Building F, Room 14, Telephone 676-7016.

The Bachelor of General Studies curriculum aims to provide the adult part-time student with the opportunity to obtain a broad education. For that reason the course work required in the first and second years is distributed among communications (written and oral), the humanities, natural and mathematical sciences, and the social studies. In choosing the third- and fourth-year course work required in departments related to their concentration, students should obtain counseling through the faculty advisor.

Students planning to work toward master's degrees are advised to plan their bachelor's programs so that they will meet the prerequisite requirements of the school or college of their choice. Students planning to enter graduate programs which require a reading knowledge of a foreign language are advised to include two years of one foreign language in their bachelor's program.

Scholarship.—To qualify for graduation, 120 hours of course work must be passed and an index achieved of 2.00 based on courses passed with grades of *A*, *B*, *C*, or *D*. The index is obtained by dividing the number of quality points by the number of semester hours of courses passed with grades of *A*, *B*, *C*, or *D*. Both the number of quality points and the number of semester hours of courses are based on the student's record at this University. The index is computed as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point, for each semester hour for which the student has registered. Courses marked *F*, *W*, *I*, *NC*, or *CR* are not considered in determining the index, though courses passed with *CR* count toward the 120 overall requirement. (When a formal grade is recorded for an *Incomplete*, the new grade will be included in the computation of the index.) Grades in courses taken at another institution are not considered in computing the index.

Students must also achieve no lower than the grade of *C* in required courses in the selected area of concentration. A *D* in a required course will satisfy a curricular requirement in the area of concentration and may count toward the total 120 hours, but it shall *not* count toward the minimum number of hours required in the area of concentration.

The system of grading is described on pages 32–34. For regulations concerning probation, suspension, and readmission, see pages 34–35.

First and Second Years

	Semester Hours
COMMUNICATIONS	6
Engl 9 or 10, 11	3
Engl 20	3
SpDr 1, 11, 111, or 121	
HUMANITIES*	
Twelve semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; Foreign Language (2 years of one language); Mus 3 and 4; Phil 50; Rel 9 and 10, 59, 60; Slav 91–92	12

* Students who plan to continue study for advanced degrees are urged to fulfill the 2-year language option.

NATURAL AND MATHEMATICAL SCIENCES

	Semester Hours
Six to eight semester hours selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, or 3 and 4; Ocea 101, 102, 103–4; Phys 1 and 2, or 3 and 4, or 9–10	6–8
Six to eight semester hours selected from the following: Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Stat 51, 54, 101–2	6–8

SOCIAL STUDIES

Twelve semester hours selected from two of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40, 71–72; PSc 1 and 2, 2 and 3; Psyc 1 and 8, 1 and 22, 1 and 29; Soc 1 and 2	12
Electives (depending on science option)	8–12
	60

Third and Fourth Years

Concentrations are offered in economics, history, mathematics, political science, psychology, and sociology.

CONCENTRATION REQUIREMENTS (to be selected in consultation with the faculty advisor):

100-level courses in the department of the selected area of concentration	24*
Courses in two or more related departments	18*
ELECTIVES	18*
TOTAL	120

BACHELOR OF GENERAL STUDIES—AREA OF CONCENTRATION IN LAW ENFORCEMENT

Faculty Advisor: Earl H. Williams, Assistant Professorial Lecturer in Forensic Sciences, 2120 L St., N.W., Suite 255, Telephone 676-7124.

The Bachelor of General Studies degree with a concentration in law enforcement is designed for students who are now working as police officers or who are interested in future careers in law enforcement. The curriculum will provide a broad academic base in the arts and sciences, as well as professional competency to function effectively in investigative and regulatory agencies at the municipal, county, state, and federal levels. The scholarship requirements and system of grading is the same as for the other areas of concentration. See pages 23, 32–35.

* Students selecting Psychology as an area of concentration are required to take 18 semester hours of 100-level Psychology courses; students selecting Sociology as an area of concentration are required to take 18 semester hours of 100-level Sociology courses. In both areas students must also take 24 semester hours of courses in two or more related departments.

First and Second Years

	Semester Hours
ENGLISH	
Engl 9 or 10, and 11 or 12*	6
HUMANITIES	
Six semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; Foreign Language (beyond the first-group courses); Mus 3, 4; Rel 9–10, 59, 60	6
NATURAL AND MATHEMATICAL SCIENCES	
Six to eight semester hours selected from the following: BiSc 3–4, 11–12; Chem 3–4, 11–12, 15–16*, Geol 1–2; Phys 1, 2	6–8
Six semester hours selected from the following Mathematics combinations: 9 and 10, 9 and 104*, 31 and 32, 51 and 52; Stat 51 or 54 or 101 in combination with 97* or 102 or 105	6
PREREQUISITES	
PSc 2; Psyc 1 and 8; Soc 1	12
STRONGLY RECOMMENDED	
Foreign Language: First-group courses	
ELECTIVES	22–24
	60

Third and Fourth Years

REQUIRED COURSE WORK		
LEnf 121:	Survey of Forensic Science I	3
LEnf 122:	Survey of Forensic Science II	3
LEnf 142:	Criminal Law and Procedure	3
†LEnf 180:	Law of Arrest, Search and Seizure	3
PSc 115:	U.S. Constitutional Law and Politics II	3
Psyc 101:	Abnormal Psychology	3
Soc 129:	Race and Minority Groups	3
†Soc 135:	Juvenile Delinquency	3
Soc 136:	Criminology	
Soc 139:	Society and the Deviant	
		30

* Campus course. See the current *Undergraduate and Graduate Bulletin* for course description.

† See course descriptions in this bulletin for prerequisite courses.

ELECTIVES

Thirty hours of electives are to be chosen in consultation with the faculty advisor. Nine semester hours must be elected in law enforcement courses; remaining electives may be chosen from courses listed in the current *Undergraduate and Graduate Bulletin*. Courses numbered below 100 are more suitable for the first and second years. The following electives are in or are closely related to the field of law enforcement.

BAd 102: Fundamentals of Management
BAd 105: Personnel Management
*BAd 106: Leadership in Personnel Management
LEnf 123: Criminal Investigation
LEnf 131: Police Organization and Administration II
LEnf 141: Criminal Evidence for Police
LEnf 151: Criminal Law in the District of Columbia
LEnf 152: Criminal Law in Maryland
LEnf 153: Criminal Law in Virginia
LEnf 160: Presentation of Testimony
LEnf 162: White Collar Crime
LEnf 163: Police and Community Relations
LEnf 164: Evidence Photography
LEnf 165: Organized Crime
†Phar 115: Drug Abuse Education
PSc 111: State and Urban Politics
†PSc 112: State and Urban Policy Problems
Psyc 112: Psychology of Adolescence
Psyc 144: Personal and Industrial Psychology
Psyc 156: Psychology of Attitudes and Public Opinion

BACHELOR OF SCIENCE IN ADMINISTRATION

Academic Advising: Information and Advising Center, Government 201B, Telephone 676-7027.

Note: Applications are no longer being accepted for admission to the Bachelor of Science in Administration degree program. Those students who have been accepted as degree candidates may continue to pursue their program on- or off-campus until all graduation requirements have been met.

The Bachelor of Science in Administration curriculum aims to provide the adult part-time student with the opportunity to obtain a broad education in preparation for careers in accounting or business administration. Students should obtain both general educational counseling and specific area of concentration advising when initially considering their curriculum. A conference concerning curriculum planning for courses to be taken as a degree candidate is *required* of each applicant *before* admission to degree candidacy. The course work required in the first and second years is a general curriculum for both the Accounting and Business Administration concentration. The course work required for the third and fourth years is chosen from either the Accounting or Business Administration area of concentration curriculum. In choosing the third- and fourth-year course work required in departments related to their

* See course descriptions in this bulletin for prerequisite courses.
† Strongly recommended.

concentration, students should obtain counseling through the appropriate departmental faculty advisor. Except for Acct 115, 121, and 191, no student may receive credit for courses in Accounting and Business Administration numbered *above the 100-level* unless third-year (junior) standing has been attained. Also, an exception is made for those 100-level courses (BAd 102, 105, and Mgt 118) specifically approved by the School of Government and Business Administration which are taken in the program of study leading to the degree of Associate in Arts in General Studies. Students who elect BAd 102, 105, and Mgt 118 while enrolled in the Associate in Arts in General Studies degree program will receive *elective* credit for these courses if they transfer to the Bachelor of Science in Administration degree program as juniors. However, an additional course in each of the three areas covered by these courses must be taken to fulfill the core requirements of the degree of Bachelor of Science in Administration. The course work for all four years is described on the following pages.

Students are reminded that Accounting and Business Administration courses taken at accredited 2-year colleges may be applied toward the degree of Bachelor of Science in Administration provided they are comparable to below 100-level courses required in the first and second years of the curriculum.

Students planning to work toward master's degrees are advised to plan their bachelor's programs so that they will meet the entrance requirements of the school or college of their choice.

CREDIT/NO CREDIT OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better, may, with the approval of the advisor and the dean, take one course a semester and receive a grade of *CR*, Credit, or *NC*, No Credit, which will be recorded on the student's transcript but will not be reflected in the quality-point index. No student will be allowed to take more than four credit/no credit courses. A student must sign up for such an option at registration. Under no circumstances may a student change from a credit/no credit status to graded status or vice versa after the end of registration. Courses required in the student's major field may not be taken on the credit/no credit basis. A transfer student may not choose this option until the second semester of enrollment in the University.

SCHOLARSHIP

The system of grading and computing scholarship is described in detail on pages 32–35. For regulations concerning probation, suspension, readmission, see pages 34–35.

To graduate a student must have the following: (1) a cumulative quality-point index of at least 2.00 and (2) a quality-point index in the area of concentration of at least 2.00. All courses taken at this University in the Bachelor of Science in Administration degree program (both required and elective courses) are to be included in the quality-point index calculation. Required 100-level courses (not including electives) are used in the calculation of the cumulative quality-point index in the area of concentration.

Accounting and Business Administration Curriculum

First Year

	Semester Hours
ACCOUNTING	
Acct 1–2	6
ENGLISH COMPOSITION	
Engl 9 or 10, 11	6
SCIENCE	
Six to eight semester hours selected in consultation with the advisor from the following: BiSc 3–4; Chem 5–6; Geog 51 and 52; Geol 1–2, or 3 and 4; Phys 1 and 2, or 3 and 4, or 9–10	6–8
SOCIAL STUDIES	
Econ 1–2	6
ELECTIVES (to be selected in consultation with the advisor from courses other than in accounting, business administration, and economics	4–6
	30

Second Year

BUSINESS ADMINISTRATION	
BAd 51	3
ART, LITERATURE, LANGUAGE, MUSIC, AND PHILOSOPHY*	
Six semester hours selected in consultation with the advisor from the following: Art 31–32; Engl 43–44, 45–46, 51–52, 71–72; Foreign Language (1 full year of a foreign language); Mus 3; Phil 50; Rel 9 and 10, or 21 and 22, or 59 and 60	6
MATHEMATICS	
†Math 31 and 32, or 51 and 52	6
SOCIAL STUDIES	
Psyc 1, 8	6
Six semester hours selected in consultation with the advisor from the following: AmCv 71–72; Anth 1–2; Hist 71–72; PSc 3 or 1, 2; Soc 1	6
STATISTICS	
Stat 51 or 101	3
	30

* Students selecting Accounting as an area of concentration may postpone this 6-hour requirement until the third year if they wish to elect Acct 121 and 191 in the second year.

† Math 31 and 32 are recommended for those students who plan to take graduate work in quantitative methods.

Accounting Concentration Curriculum

Third Year

		Semester Hours
Acct 101:	Cost and Budgetary Control	3
*Acct 121:	Intermediate Accounting	3
Acct 161:	Federal Income Taxation	3
*Acct 191:	Advanced Accounting	3
BAd 102:	Fundamentals of Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
BAd 161:	Commercial Law	3
Mgt 118:	Introduction to Information Processing	3
Elective:	(Selected from courses other than in accounting, business administration, or economics, with the approval of the advisor)	3
		30

Fourth Year

Acct 132:	Accounting Theory	3
Acct 171:	Auditing	3
Acct 181:	Accounting Systems	3
BAd 101:	The Business Environment	3
BAd 181:	Manufacturing Production	3
BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
	Three semester hours selected in consultation with the advisor from the following:	
Stat 111:	Business and Economic Statistics I	
Stat 155:	Introduction to Probability	
Stat 187:	Theory of Sampling	
Elective:	(Three semester hours selected from 100-level courses in accounting, business administration, or economics with the advisor's approval)	3
Elective:	(Three semester hours selected from courses in other departments with the advisor's approval)	3
		120
	Total semester hours	

Business Administration Concentration Curriculum

Third Year

Acct 193:	Business Budgeting	3
BAd 102:	Fundamentals of Management	3
BAd 105:	Personnel Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
Mgt 118:	Introduction to Information Processing	3

* If Acct 121 and 191 are elected in the sophomore year, students replace this requirement with 6 semester hours of humanities (see above).

		Semester Hours
Electives:	(Six semester hours selected in consultation with the advisor from 100-level courses in accounting, business administration, or economics)	6
Electives:	(Six semester hours selected in consultation with the advisor from 100-level courses)	6
		30

Fourth Year

BAd 101:	The Business Environment	3
BAd 161:	Commercial Law	3
BAd 181:	Manufacturing Production	3
BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
Psyc 144:	Personnel and Industrial Psychology	3
Electives:	(Six semester hours selected in consultation with the advisor from 100-level courses in accounting, business administration, or economics)	6
Electives:	(Six semester hours selected in consultation with the advisor from 100-level courses)	6
	Total semester hours	120

Associate in Science in Cartographic Science

Associate in Science in Geodesy

Bachelor of Science in Cartographic Science

Bachelor of Science in Geodesy

Bachelor of Science in Oceanography

Faculty Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography; Telephone 946-3557. Counseling by appointment only, Telephone 676-7000.

The course work in these two- and four-year curricula is offered both on and off campus. However, the cartography, geodesy, and oceanography courses are given only at selected off-campus locations. Following is a listing of these off-campus locations, the distance from campus, and method of available transportation. Students attending these classes are expected to make their own arrangements for transportation. (Many students arrange private transportation on the first night of class.)

Facility	Distance in miles	Method of Transportation
NOAA-Gramax Building, 8060 13th Street, Silver Spring, Md.	9	Public
NOAA-Page Building, 3100 Whitehaven Parkway, N.W., Washington, D.C.	2	Public

NOAA-NBOC-2, 5640 Nicholson Lane, Rockville, Md., telephone 443-8626 for room assignments (Wisconsin Ave., Rt. 240)	20	Public
DMA-Hydrographic Office, Federal Office Bldg. No. 4, Suitland, Md.	12	Private
DMA-TOPO Command, 6101 MacArthur Blvd., N.W., Washington, D.C.	7	Public
U.S. Geological Survey, Reston, Va.	20	Private
St. Luke's Episcopal Church, Old Georgetown Road and Grosvenor Lane, Bethesda, Md.	20	Private

Entrance requirements are stated on pages 16–20; residence requirements are stated on page 48.

The system of grading is described on pages 32–35. For regulations regarding probation, suspension, and readmission, see pages 34–35.

The Associate in Science degree may be granted to a student who has completed 60 semester hours in courses listed under either the cartography or geodesy option. The Bachelor of Science degree may be granted to a student who has completed 120 hours in courses listed under either cartography, geodesy, or oceanography.

General Requirements

All candidates for the degree of Bachelor of Science will pursue a general arts and sciences curriculum until they begin work in their major field. Except for two general course requirements, all curriculum requirements leading to these degrees are established by the major field program.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequate achievement in the field of English Composition, either by examination or by taking English 9 or 10 and English 11 or 12. This requirement may not be postponed.

2. Each student, at some point in the college career, must undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social studies. As each major field will represent one of these three areas, the requirement may be fulfilled by taking no less than six semester hours in each of the other two areas. These six credits may be in approved introductory courses, or in approved advanced courses if the student is qualified and receives the instructor's permission. Courses simply waived (no credit assigned) cannot satisfy the meaningful initiation requirements. Departments and programs are listed below under the three categories.

HUMANITIES	NATURAL AND MATHEMATICAL SCIENCES	SOCIAL STUDIES
Art	Biological Sciences	American Civilization
*East Asian Languages and Literatures	Cartography	Anthropology
English	Chemistry	Economics
*Germanic Languages and Literatures	Geodesy	Geography and Regional Science
	Geology	History

* Basic language courses (normally the first two years) are considered "tool studies" and are not acceptable in fulfillment of "meaningful initiation" in the humanities.

Music
Philosophy
Religion
*Romance Languages and Literatures
*Slavic Languages and Literatures
Speech and Drama
Mathematics
Oceanography
Physics
Statistics
Journalism
Political Science
Psychology
Sociology

ASSOCIATE IN SCIENCE IN CARTOGRAPHIC SCIENCE

The following requirements must be fulfilled:

1. The general requirements in English.
2. Prerequisite courses — Cart 1, 2.
3. Required courses in related areas — (a) Math 31, 32; (b) Geod 12, 17; (c) Stat 91† or 107, at least one course from Stat 97,† 106,† 110,† 114;† (d) At least two courses from Geol 1 or 3 or 21, Geol 2 or 4 or 22; Phys 1 or 3 and 15;† Chem 11–12; Ocea 103–104.
4. Required courses in the major — Cart 102, 104, 111, 115, 116, and 125 or 126. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Cart 107, 120, 121, 131; Geod 110, 117, 119, 150, 151.

ASSOCIATE IN SCIENCE IN GEODESY

The following requirements must be fulfilled:

1. The general requirements in English.
2. Prerequisite: Geod 17.
3. Required courses in related areas — (a) Math 31, 32, 33, 124; (b) Phys 1 or 3; (c) Cart 107; (d) Stat 97† or equivalent programming experience, and 107.
4. Required courses in the major — Geod 110, 150, 151, 160, 161, and at least one course from Geod 117 or 119, 156, 165–166. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Math 139, 153, 157;† Phys 161;† Stat 157–158;† Ocea 101, 105, 110; Geol 1 or 3 or 21.†

BACHELOR OF SCIENCE IN CARTOGRAPHIC SCIENCE

The following requirements must be fulfilled:

1. The general requirements as stated above.
2. Prerequisite courses — Cart 1, 2.

*Basic language courses (normally the first two years) are considered "tool studies" and are not acceptable in fulfillment of "meaningful initiation" in the humanities.
†Campus course. See the current *Undergraduate and Graduate Bulletin* for course description.

3. Required courses in related areas — (a) Math 31, 32, 33; (b) Stat 91* or 107 and at least one course from Stat 97,* 106,* 110;* (c) Geod 12, 13, 17, 18, 110; (d) At least four courses from Geol 1 or 3 or 21,* Geol 2 or 4 or 22;* Phys 1 or 3, 14,* 15,* Chem 11–12; Ocea 103–104.
4. Required courses in the major — Cart 102, 104, 107, 108, 111, 115, 116, 120, 121, 125 or 126, 131. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Geod 117, 119, 150, 156; Cart 113, 128, 135; Phys 11–12;* Ocea 11, 105; Math 124, 153.

BACHELOR OF SCIENCE IN GEODESY

The following requirements must be fulfilled:

1. The general requirements as stated above.
2. Prerequisite courses — Geod 17, 18.
3. Required courses in related areas — (a) Phys 1 or 3 and 15;* (b) Math 31, 32, 33, 124; (c) Cart 107; (d) 1 or 3 or 21;* (e) Ocea 101, 102 or 103–104, 105; (f) Stat 97* or equivalent programming experience, and 107.
4. Required courses in the major — Geod 110, 150, 151, 160, 161, and at least 4 courses from Geod 117, 119, 156, 158, 165–166. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Math 113,* 139, 140, 141, 142,* 153, 157;* Ocea 110; Phys 161, 162; Stat 106, 110, 114, 157–158.
6. Students considering graduate studies should acquire a reading knowledge of either French, German, or Russian.

BACHELOR OF SCIENCE IN OCEANOGRAPHY

The following requirements must be fulfilled:

1. The general requirements as stated above.
2. Prerequisite courses — Ocea 11 or Cart 1, Ocea 101 and 102.
3. Required courses in related areas — (a) Chem 11–12; (b) BiSc 11, BiSc 12 or 101* or 106* or 140;* (c) Phys 1 or 3, 15;* (d) Math 31, 32, 33; (e) Cart 107, 108; (f) Geol 1 or 3 or 21, 2 or 4 or 22;* and (g) Stat 91* or 107 and Stat 97* or equivalent programming experience.
4. Required courses in the major — Ocea 105, 110, 112, 114, 115, 120 and at least three courses from Ocea 111, 113, 122, 124, 130, 132. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: courses chosen from among the following for students interested in
   (a) Physical Oceanography — Phy 161,* 162.*
   (b) Biological Oceanography — BiSc 143,* 144,* 149,* 150.*

* Campus course. See the current *Undergraduate and Graduate Bulletin* for course description.

(c) Geological Oceanography — Geol 111,* 112,* 117,* 122, 163.*
(d) Chemical Oceanography — Chem 22,* 111–112.*

6. Students considering graduate studies should acquire a reading knowledge of either French, German, or Russian.

SPECIAL DEGREE PROGRAMS

Servicemen's Opportunity College (SOC)

George Washington University has been designated a Servicemen's Opportunity College (SOC). SOC provides opportunities for active duty servicemen and women to pursue educational program goals through courses offered on base, in the evenings, on weekends, and at other nontraditional times. In support of the concept, George Washington University, while still maintaining its normal academic standards, assumes the responsibilities of meeting the educational needs of an individual serving in the Armed Forces. Provisions have been established whereby these individual needs can be met. Specifically, individuals who apply for admission as degree candidates for either the Associate's or Bachelor's degree from George Washington University's Columbian College of Arts and Sciences may, at their request, be designated as SOC students. Such students will be assured of a degree completion program through use of the agreement that follows:

AGREEMENT

George Washington University, a Servicemen's Opportunity College, agrees to the following:

I. Upon admission to Associate in Arts in General Studies or Bachelor of General Studies degree candidacy, the student may take the required course work either on or off campus. Regardless of where taken, courses of study taken while a degree candidate may be applied toward the degree sought, as a requirement or an approved elective. Although the grade of *D* is not acceptable for transfer, it may be used to satisfy a curriculum requirement. It may not, however, be counted toward the total number of semester hours required for the degree, and it should not be repeated. Courses will be taken from George Washington University unless the serviceman is transferred to a location not served by this University. In the case of transfer and in consideration of the student's future assignment, arrangements will be made between the student and the assigned counselor by the College of General Studies to ensure that the courses taken elsewhere satisfy the George Washington University program.

II. Academic credit may be obtained by any one or a combination of the following:

A. Registration as an on- or off-campus, full- or part-time student at this University.

B. Advanced standing for academic studies taken at other accredited institutions where such studies meet the requirements for the degree, or by examination. (A maximum of 42 semester hours allowed for the associate's degree;

* Campus course. See the current *Undergraduate and Graduate Bulletin* for course description.

a maximum of 90 semester hours allowed for the bachelor's degree.)

Within the maximum of 42 hours of credit allowed for advanced standing toward the Associate in Arts in General Studies degree, a maximum of 30 hours may be obtained by any one or combination of the methods below. Within the maximum of 90 hours of credit allowed for advanced standing toward the Bachelor of General Studies degree, a maximum of 60 hours may be obtained by any one or combination of the methods below.

1. ***College-Level Examination Program (CLEP) Subject Examinations.***—CLEP Subject Examinations are offered in more than 20 subject areas. These tests measure achievement in the equivalent of specific college-level courses. (Credit may not be earned by passing the examination after having taken the equivalent course.) Maximum credit allowed for Associate's degree, 30 semester hours; maximum allowed for Bachelor's degree, 60 semester hours. A candidate for a degree from any school at this University must seek departmental approval *prior* to taking the examination in order to receive credit for a CLEP Subject Examination.

2. *College-Level Examination (CLEP) General Examinations.*—CLEP General Examinations are offered in five areas: mathematics; social sciences; humanities; natural sciences; and English composition. (Credit—advanced standing—is not given for the General Test in English Composition.) Maximum credit allowed, 24 semester hours.

3. *Columbian College of Arts and Sciences Special Departmental Examinations.*—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. (If an appropriate CLEP Subject Examination is available, the department may choose to employ it.) The student who performs satisfactorily may receive credit (advanced standing), waiver of requirement, or both, at the discretion of the department. (A student who has previously taken examinations to waive course requirements may not, however, at a later time take examinations for credit in the same courses.) Special departmental examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparing, administering, and grading. Maximum credit allowed for Associate's degree, 30 semester hours; maximum allowed for Bachelor's degree, 60 semester hours.

4. *Service Schools.*—A maximum of 30 (or a maximum of 12 hours if the courses are "professional") semester hours may be obtained on the basis of service schools satisfactorily completed, as evaluated in accordance with the "Guide to the Evaluation of Educational Experience in the Armed Forces," issued by the Committee on Accreditation of Service Experience. Ordinarily such subjects are counted as electives. No credit will be allowed for military experience as such.

5. *Correspondence Courses.*—A maximum of 15 semester hours may be earned through the successful completion of correspondence courses of college level which are offered by the U.S. Armed Forces Institute or a regionally accredited college or university.

III. The minimum requirement for the Associate in Arts in General Studies degree is 60 semester hours; the minimum requirement for the Bachelor of General Studies degree is 120 semester hours. A minimum of 18 semester hours for the Associate's degree and a minimum of 30 hours for the Bachelor's degree must be completed at George Washington University, but may be com-

leted at any point in the student's program of study. At least 6 semester hours the selected area of concentration must be taken at this University.

IV. The College of General Studies will handle and coordinate administrative matters and be the point of contact with the college granting the degree. he provisions as stated in the *College of General Studies Bulletin* will apply all cases not specifically mentioned in this agreement.

V. Tuition and fees will be as stipulated in the *College of General Studies ulletin* on a year-to-year basis.

VI. Students accepted under this program are subject to the probation and spension regulations of the University, and are required to maintain scholastic standards.

VII. In addition to trained counselors, University representatives are assigned to each installation to assist in the counseling function.

rmy Help for Education and Development (Project AHEAD)

eorge Washington University is cooperating with the U.S. Army in Project HEAD. The primary objective of the program is to permit affiliation of alified young persons with the University upon their entrance into the Army. he University will open and maintain an active record file and assign a counlor to the student while he or she is in the Army. In effect George Washington niversity becomes his or her alma mater. The counselor helps the student plan he course of study and advises which courses to pursue among those offered on near the base or installation. After discharge from the Army, the veteran rolls as a full-time student to complete the degree. Individuals designated as oject AHEAD students who desire to obtain an associate's or bachelor's dee from George Washington University's Columbian College of Arts and ances will be assured of a degree completion program through the following ocedures:

Students who are admitted under normal rules and regulations are required register and pay a continuous registration fee for one semester. Upon comion of that semester students present their active duty orders and will be anted military leave for the period of active duty.

A student who is not readily admitted will be required to complete a 30 mester hour pre-qualifying program based upon the student's needs as evaluted. Upon successful completion of the program at accredited colleges or versities, the student will receive advanced standing and be admitted as a gree candidate based upon the current catalogue at that time. After that the ocedure outlined above will apply.

A time limit of five years is imposed from the time of admission or comencement of the pre-qualifying program for the student to be readmitted and mmence resident requirements at George Washington University.

ccelerated Associate's Degree Completion Program

The Accelerated Associate's Degree Completion Program is available at Fort ter in Virginia, and at the Washington Navy Yard in the District of Colum-

This accelerated program permits an individual to complete the degree of sociate in Arts in General Studies in approximately 20 months through part-e study. Time to complete the program will vary according to the amount

of advanced standing granted through transfer of credit or by examination and according to the number of courses the student is enrolled in. The program is designed for the highly motivated individual who must complete a program of study in a limited period of time. Classes are open to everyone.

Graduate Degrees

MASTER OF ARTS

THE DEGREE OF MASTER OF ARTS with a field in Religion and Medical Care is a degree program offered by the Graduate School of Arts and Sciences under the direction of the Department of Religion.

The program of study is interdisciplinary and combines both professional and academic work. The intent of the program is (1) to provide training in an academic graduate milieu of chaplains and clergymen whose professional effectiveness might be increased through the combination of clinical experience and academic study; (2) to provide a program of study for those medical students who have a sense of the significance of theological insights for the care of the whole person and who desire to combine their medical education with this correlative study; and (3) to provide a program of research and study in the area of religion and medical care for those whose theological training (e.g., in ethics or sociology of religion) and interest are directed toward a vocation in teaching. Support for the program comes from (1) clinical training programs of the National Naval Medical Center, National Institutes of Health, and Walter Reed General Hospital; and (2) the departments of Health Care Administration, Psychology, Religion, and Sociology, and departments of the School of Medicine and Health Sciences.

The program of study leading to the degree of Master of Arts in the field of Religion and Medical Care consists of 36 semester hours of approved course work with or without a thesis and the passing of a Master's Comprehensive Examination.

For information concerning admission requirements and the specific requirements for the degree, contact the Graduate School of Arts and Sciences or the chairman of the Department of Religion.

MASTER OF ARTS IN EDUCATION

The School of Education has academic jurisdiction over the degree of Master of Arts in Education. Off-campus degree programs are designed for educators who wish to increase their knowledge of professional and academic information and to prepare for special types of educational service in public and private schools. They are also designed to further the preparation of individuals for non-traditional areas of education in both the public and private sectors of society, regardless of clientele, age, or institutional base.

The Master of Arts in Education degree programs offered at off-campus enters are available in the following fields: elementary education; higher education; human resource development; secondary education; early childhood special education; supervision and human relations; guidance and counseling; and generic counseling.

Admission

For detailed information see "Admission as a Degree Candidate," page 17, and page 20.

Requirements for the Degree

The program of study consists of a minimum of 33 or 36 semester hours of course work in core courses, depending upon the chosen field. The thesis (equivalent to six semester hours) is optional.

RESIDENCE

Advanced standing is granted for approved courses taken at other accredited institutions; however, a minimum of 30 semester hours must be completed at this University, with no less than 21 semester hours completed after admission to Master's degree candidacy.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive a grade of *C* in more than two courses are subject to suspension. Students who receive a grade of *F* must confer with the dean of the School of Education before enrollment for further work.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 33.

Removing an Incomplete.—Although the grade of *I may* remain on the records for a maximum of one year, the instructor should normally set a much shorter period within which the uncompleted work (usually the final examination or a required paper) must be made up. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere. An "Incomplete" cannot be made up after the lapse of one calendar year except by written permission of the Dean's Council. An "Incomplete" which is not removed within one calendar year is automatically changed to an *F*.

THE THESIS

Students who elect a thesis must register on campus for Educ 299–300. The choice of the thesis subject must be approved in writing by the student's advisor and filed in the office of the dean. A statment of the School of Education standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, an additional calendar year may be granted without further tuition payment. The student must, however, maintain continuous registration (see page 37) during this period. If the preparation of the thesis extends beyond the additional calendar year, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

TAKING COURSES ON CAMPUS

A student registered in a degree program off campus who wishes to register for a course on campus, *must* file a formal graduate application which may be obtained from the office of the dean of the School of Education.

MASTER'S COMPREHENSIVE EXAMINATION

In addition to the course examinations, the candidate must pass a special three-hour comprehensive examination in the area of specialization. Candidates for the examination must be registered for the semester it is to be taken, and must file a written application in the office of the dean of the School of Education no later than 30 days prior to the date of the examination.

EDUCATION SPECIALIST

The School of Education provides an off-campus program of advanced study leading to the degree of Education Specialist in the field of Administration and Higher Education. This program is for students with master's degrees in education who seek further professional preparation.

Admission

For detailed information see "Admission as a Degree Candidate," pages 17 and 22.

Requirements for the Degree

A minimum of 30 semester hours beyond the requirements for the degree of Master of Arts in Education at this University is required. At least 21 hours of this work must be in courses offered by this University, on campus or in the approved off-campus degree center to which the candidate has been admitted; with the approval of the advisor, the remaining semester hours of the program may be taken at another approved university. A maximum of five calendar years is allowed for the completion of the program. At least 12 of the required 30 hours must be in appropriate graduate courses in education selected from the following areas: (1) foundations and cognate study, (2) background and general principles of the field of study, (3) an area of specialization.

SCHOLARSHIP

Scholarship requirements for the degree of Education Specialist are the same as those for the degree of Master of Arts in Education (see page 65).

THE COMPREHENSIVE EXAMINATION

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

MASTER OF ARTS IN SPECIAL STUDIES AND MASTER OF SCIENCE IN SPECIAL STUDIES

The Graduate School of Arts and Sciences has academic jurisdiction over the degrees of Master of Arts in Special Studies and Master of Science in Special Studies. These degree programs provide a course of study appropriate to those students who wish to emphasize interdisciplinary work. They are offered both on and off campus. The off-campus programs can only be offered for a group of students with mutual educational goals. The programs allow a maximum of flexibility; however, they must be developed around identified objectives and must provide a structured sequence of study toward these goals. University representatives will work with interested groups to develop suitable programs. The contemplated curriculum must be approved prior to admission to the Graduate School. A student interested in interdisciplinary work leading to one of these degrees who is not in a group program must register on campus.

For information on special studies programs currently available in off-campus programs, see "Special Degree Programs," pages 83–85.

For detailed information on the regulations for the off-campus degrees, see the *Handbook for Graduate Students*, available at the office of the dean of the Graduate School of Arts and Sciences.

Admission

For detailed information, see "Admission as a Degree Candidate," page 17, and page 21.

Requirements for the Degrees

The program of study consists of 36 semester hours of course work including a majority of courses in the arts and sciences (e.g., economics, natural sciences, political science, psychology, sociology, statistics), with not more than one-third from any single department. *There are no thesis or tool requirements.* Advanced undergraduate courses (those numbered 101–200) may be included in the program of study upon the approval of the Graduate School and with the provision that students complete additional work for graduate credit.

Each program of study must be approved by the dean of the Graduate School of Arts and Sciences and the departmental advisors.

RESIDENCE

A minimum of 27 semester hours must be completed after admission to Master's degree candidacy.

SCHOLARSHIP

Graduate students are expected to maintain a minimum accumulative grade average of *B* (3.00) in all course work in the program of studies. Individual

departments may require a higher average.

In the case of a student who receives a grade of *F* for a course in his program of studies, the Graduate School will require a departmentally approved written statement justifying the student's continuance in the Graduate School and outlining the program to be followed. Continuation is contingent upon the dean's approval. A course in the program of studies for which an *F* is received cannot be subsequently removed from the program even though another course is taken as a substitute.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 33.

Removing an Incomplete.—An "Incomplete" must be made up before the lapse of one calendar year. An "Incomplete" which is not removed within one calendar year remains as a grade of *I* on the student's record. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

MASTER'S COMPREHENSIVE EXAMINATION

Master's degree candidates must pass a Master's Comprehensive Examination administered by the Graduate School of Arts and Sciences on campus on specified dates.

A student who fails to pass the Master's Comprehensive Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled date. If the exam is failed a second time, no further opportunity to take the examination is permitted.

Withdrawal

Graduate students who intend to withdraw from the Graduate School of Arts and Sciences should inform the School in writing. The last day for complete withdrawal without academic penalty is at the end of the eighth week of classes.

Leave of Absence

If a student is temporarily unable to continue the program of studies, the student may request leave of absence for a specific period of time, not to exceed one calendar year. When the period of leave has expired, it is the student's responsibility to notify the Graduate School at least two months in advance of a given registration period of the intention to reregister. If the student fails to reregister, candidacy will be terminated.

MASTER OF SCIENCE IN ADMINISTRATION

The School of Government and Business Administration has academic jurisdiction over the degree of Master of Science in Administration. This degree program provides a course of study appropriate for those students currently working in government or industry. It is a professional degree, preparing

graduates for positions of higher and broader responsibility and generally improving their competence as administrators. Students expecting to continue in a doctoral program should consult the Committee on Doctoral Studies in the School of Government and Business Administration concerning necessary prerequisites. Students will usually find it advantageous to consult with the Committee early in planning their Master's degree programs.

The University cannot guarantee that all courses in this curriculum will be offered at every off-campus center. However, any student who has been admitted to degree candidacy may arrange to complete the curriculum by registering on campus. All work for this degree must be completed in five years, unless an extension of time is granted by the dean. Continuous registration does not extend a student's degree candidacy beyond the five-year time limit.

Objectives of the School of Government and Business Administration

The principal objective of the School of Government and Business Administration is to prepare its graduates for positions in the management of complex organizations in both business and government. The degree programs are designed to prepare students both for *entrance* into business and government and for *advancement* to high-level management positions.

Programs in the School include examination of administrative principles and quantitative approaches to decision-making common to both business and government. These programs stress the points at which major policy decisions of either business or government must give consideration to related policy decisions of the other. Emphasis is placed on the fact that management education is not limited to organizational techniques but is, in the broadest sense, education for management responsibility.

The degree of Master of Science in Administration develops the elements common to all management positions regardless of the nature of the operation. This degree program is based on the study of the principles of management, human relations, and problem-solving, plus an area of specialization.

Admission

For detailed information see "Admission as a Degree Candidate," page 17, and pages 20–21.

Requirements for the Degree

RESIDENCE AND TRANSFER OF CREDIT

A minimum of 27 semester hours of graduate work must be completed while registered as a degree candidate in this off-campus program.

The thesis and thesis seminar (six semester hours) may be included in the 27 hours of course work taken in residence. A maximum of one-quarter of the semester hours of graduate course work required for the degree may be approved for transfer to the School of Government and Business Administration from the Division of University Students, the College of General Studies, another degree-granting division of this University, or another accredited college or university under the following conditions: the course work must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be gradu-

ate-level course work, it must have been taken within the past two years, and the student must have received a grade of *B* or better. This action must be approved by a petition to the advisor and the dean. A transcript of the course work must be on file before the petition can be considered.

SCHOLARSHIP

An average of *B* or better is required for the Master's degree. The grade of *C* is not considered as failing but must be counterbalanced by a grade of *A* in a graduate course of equal status. (See pages 34–35 for information on probation and suspension.)

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 33.

Removing an Incomplete.—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

THESIS

With the approval of the advisor, a thesis may be substituted for six semester hours of course work.

The thesis subject and the thesis in its final form must be approved by the director of the thesis and the faculty advisor and presented to the dean of the School of Government and Business Administration no later than the date announced in the calendar. Detailed regulations regarding the form and reproduction of the thesis should be obtained from the School of Government and Business Administration.

Payment of tuition for the thesis entitles the candidate, during the two semesters he or she registers for thesis (299–300), to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, an additional successive academic year is granted without further tuition payment. The student must, however, maintain continuous registration during this period. If the preparation of the thesis extends more than three semesters beyond the date the student registers for thesis 300, he or she must register for the entire six hours of thesis again and pay tuition as for a repeated course.

COURSE SUBSTITUTION/ELECTIVES

Course substitution and electives must be selected in consultation with the faculty advisor and may be chosen from relevant offerings in accounting, business administration, management science, and public administration. Course

substitutions and curriculum modifications must be approved by the faculty advisor and the dean of the School of Government and Business Administration. Electives need only be approved by the faculty advisor. Forms are available at the Office of Counseling and Student Services, College of General Studies.

MASTER'S COMPREHENSIVE EXAMINATION

Written Master's Comprehensive Examinations are required only in certain degrees and fields of concentration. Degree candidates should consult faculty advisors about examinations required and material to be covered. In writing the examinations students are expected to correlate what has been learned in course work and the literature of their field. The examinations normally require four to eight hours. Sections broadly cover the various fields which the candidate has selected for specialization.

Examinations are scheduled three times a year, late November or early December, April, and August, and should be taken during the last semester of course registration or shortly after completion of prescribed course work. If there is a lapse of time between completion of course work and taking the examination, students must maintain continuous registration and must be registered for the semester or summer session in which the examination is taken.

A written application is filed with the department supervising the student's field of study at time of registration for the semester in which the examination is to be taken. Before applying, the student must have completed all courses in the program or be enrolled in the last semester and must have achieved a 3.00 (B) average. After applying for the examination, a candidate may withdraw only by written notice to the Department Chairman.

A candidate who fails the examination should consult with the faculty advisor as to a subsequent course of action.

Areas of Concentration

The Master of Science in Administration degree program consists of 36 semester hours of graduate work. Areas of concentration usually include a core of courses in economics, management science, and business-government relations. These core courses are included in each of the areas of concentration. Courses are listed in the generally recommended sequence in which they should be taken. Faculty advisors should be consulted for more specific guidance. In areas of concentration where the course work requires prerequisites, these prerequisites generate semester hour requirements over and above the basic 36 hour program.



I. ADMINISTRATION OF SCIENCE AND TECHNOLOGY

Faculty Advisor: Daniel D. Roman, Professor of Management Science, Government 310, Telephone 676-6678.

The field of concentration in Administration of Science and Technology explores the many aspects of technology relating to and influencing research and development management, business, and public policy. The employment of state-of-the-art technology and the creation of new technology through research and development are important processes in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The program of graduate study in this concentration has been designed to identify and study the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

Mgt 201:	Advanced Administrative Management (3)
BAd 220:	Administration of Research and Development (3)
*Mgt 225:	Managerial Statistics I (3)
PAd 235:	Technology Change and Professional Human Resource Planning (3)
Econ 220:	Survey of Principles and Issues in Economics
*BAd 222:	International Research and Development (3)
Mgt 240:	Survey of Information Technology (3)
Mgt 260:	Introduction to General Systems and Cybernetics (3)
*Mgt 207:	Human Behavior in Organizations (3)
PAd 262:	Seminar: Science, Technology, and Public Policy (3)
*BAd 229:	Seminar: Administration of Research and Development (3)
Elective:	To be selected with the approval of the advisor (3)

II. BEHAVIORAL SCIENCES IN ORGANIZATION DEVELOPMENT

Faculty Advisors: Erik K. Winslow, Associate Professor of Behavioral Sciences, Bldg. G, Rm. 204, Telephone 676-6447; Jerry Harvey, Professor of Management Science, Building Y, Room 10, 2131 G Street, N.W., Telephone 676-6205.

This area of concentration reflects the assumption that the effective utilization of the behavioral sciences is concerned with both means and ends: that the specialist in behavioral science not only is skilled in theory and research but also applies technical and specialized knowledge as a conscious force in effective organizational growth and improvement. Thus, courses are designed to equip the student with organizational concepts and behavioral skills appropriate to optimizing the utilization of a system's total resources.

This program is designed to fulfill the need for professionals capable of designing, creating, and developing the necessary behavioral and organizational systems appropriate to rapidly changing societies. Emphasis is on the interrelationships of such dimensions as motivation, leadership, problem-solving, organizational growth, and increased complexity of modern organizations and their effect upon the function of organizational development.

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* See departmental listings in this bulletin for prerequisite courses.

Mgt 201: Advanced Administrative Management (3)
Mgt 204: Quantitative Factors in Administration (3)
*Mgt 207: Human Behavior in Organizations (3)
Mgt 240: Survey of Information Technology (3)
Econ 220: Survey of Principles and Issues in Economics (3)
BAd 202: Business-Government Relations (3)
*†Mgt 208: Current Issues in Organizational Behavior (3)
*†Mgt 210: Behavioral Factors in the Process of Change (3)
*†Mgt 212: Organizational Development: Concepts and Methods (3)
Mgt 260: Introduction to General Systems and Cybernetics (3)
*Mgt 261: Fundamentals of General Management Systems and Organizational Cybernetics (GEMSOC) (3)
Elective: To be selected from the following as approved by the adviser (3)
BAd 211: Leadership and Executive Development (3)
*†Mgt 213: Consultative Processes in Organizations (3)
PAd 223: Behavioral Factors in Large and Complex Organizations (3)
PAd 233: Seminar: Manpower Development and Utilization (3)
†Psyc 245: Seminar: Organizational Behavior (3)

III. BUSINESS FINANCIAL MANAGEMENT

Faculty Advisor: Rodney W. Eldridge, Associate Professor of International Finance, Government 400, Telephone 676-6892.

This area of concentration provides a background in business budgeting, controllership, treasury, long-range planning, reporting, and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions.

Mgt 201: Advanced Administrative Management (3)
*Mgt 207: Human Behavior in Organizations (3)
Mgt 240: Survey of Information Technology (3)
BAd 202: Business-Government Relations (3)
Econ 220: Survey of Principles and Issues in Economics (3)
*BAd 231: Financial Decision-making (3)
*Acct 215: Management Accounting (3)
*Mgt 225: Managerial Statistics I (3)
*BAd 233: International Business Finance (3)
*BAd 234: Seminar: Capital Formation (3)
*BAd 237: Investment Analysis (3)
Elective: To be selected with the approval of the advisor (3)

V. GENERAL MANAGEMENT SYSTEMS AND ORGANIZATIONAL CYBERNETICS

Faculty Advisor: Richard F. Ericson, Professor of Management, Lisner Hall 601, Telephone 676-7155.

This concentration addresses the critical need for management to deal effectively with human institutions that tend to become larger and more complex. As many traditional academic fields general systems and cybernetic concepts have evolved as the interdisciplinary mode for understanding increasingly complex systems. This program is essentially interdisciplinary and transcontextual in nature. The student is afforded a range of opportunities to apply educational experience to managerial, organizational and societal problems.

† See departmental listings in this bulletin for prerequisite courses.
* Offered only on campus.

Econ 220:	Survey of Principles and Issues in Economics (3)
BAd 202:	Business-Government Relations (3)
Mgt 201:	Advanced Administrative Management (3)
Mgt 204:	Quantitative Factors in Administration (3)
*Mgt 207:	Human Behavior in Organizations (3)
Mgt 240:	Survey of Information Technology (3)
Mgt 260:	Introduction to General Systems and Cybernetics (3)
*Mgt 261:	General Management Systems and Organizational Cybernetics (GEMSOC) (3)
*Mgt 263:	Case Studies and Field Research in GEMSOC (3)
*Mgt 264:	Organizational Dynamics Simulation and Metasystemic Modeling (3)
Electives:	To be selected from the following as approved by the advisor (6)
*Mgt 241:	Management Information Systems Development and Application (3)
*†Mgt 208:	Current Issues in Organizational Behavior (3)
PAd 214:	Policy Analysis in Public Administration (3)
PAd 262:	Seminar: Science, Technology, and Public Policy (3)
Mgt 295:	Research Methods (3)
*Mgt 225:	Managerial Statistics I (3) (If this elective is chosen, Mgt 204 may not be taken.)
Econ 217–18:	Survey of Economics (3–3) (If this combination is chosen, Econ 220 may not be taken.)

V. INDUSTRIAL MANAGEMENT

Faculty Advisor: Guy Black, Professor of Business Administration, Government 302, Telephone 676-7139 or (703) 278-8074.

This area of concentration prepares students for careers in industrial management. Work covers the organization and functioning of industrial firms as well as the management practice and problems associated with them.

*Acct 215:	Management Accounting (3)
Econ 217:	Survey of Economics (3)
Mgt 201:	Advanced Administrative Management (3)
*Mgt 207:	Human Behavior in Organizations (3)
*Mgt 225:	Managerial Statistics I (3)
Mgt 240:	Survey of Information Technology (3)
BAd 202:	Business-Government Relations (3)
BAd 208:	Personnel Management and Industrial Relations (3)
*BAd 225:	Seminar: Manufacturing Production (3)
*BAd 261:	Applied Microeconomics (3)
BAd 279:	Purchasing and Materials Management (3)
*BAd 297:	Business Policy Formulation (3)

VI. INFORMATION SYSTEMS TECHNOLOGY

Faculty Advisors: John F. McCarthy, Jr., Associate Professor of Business Administration, Government 302, Telephone 676-7089; Walton E. Smith, Associate Professor of Management Science, Building Y, Room 21, 2131 G Street, N.W., Telephone 676-7159.

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* See departmental listings in this bulletin for prerequisite courses.

† Offered only on campus.

This area of concentration is designed to provide a managerial understanding of the principles of manual, mechanical, and electronic information processing, including computer programming concepts, methods, and languages; an appreciation of the capabilities, limitations, and selection procedure of information processing equipment; a knowledge of all phases of management information systems development, implementation, and evaluation; and an understanding of the roles of both management and systems personnel in information technology. It also provides an appreciation of the role of information technology as a tool of management.

Students actually participate in the development of management information systems; in the selection of computer equipment; and in the installation, management, and evaluation of management information systems during class sessions.

Mgt 201: **Advanced Administrative Management (3)**
Mgt 240: Survey of Information Technology (3)
*Mgt 207: **Human Behavior in Organizations (3)**
Mgt 260: Introduction to General Systems and Cybernetics (3)
*Mgt 225: **Managerial Statistics I (3)**
*Mgt 241: Management Information Systems Development and Application (3)
Econ 220: Survey of Principles and Issues in Economics (3)
*Mgt 242: **Comparative Computer Systems (3)**
BAd 202: **Business-Government Relations (3)**
*Mgt 243: **Management of Information Technology (3)**
Electives: To be selected from the following as approved by the advisor (6)
Mgt 244: Information Systems and Telecommunication (3)
*Mgt 245: **Data Base Management (3)**
*Mgt 249: Seminar: Information Technology (3)

VII. INTERNATIONAL COMMERCE

Faculty Advisor: Jack Zwick, Professor of Business Administration, Government 403, Telephone 676-6726.

This area of concentration prepares students for careers in firms operating on a multinational basis or about to enter the international field; for careers in the federal government and in international agencies concerned with business, industry, and finance abroad; and for the commerce option of the Foreign Service Officer Examination.

Mgt 201: **Advanced Administrative Management (3)**
Mgt 204: Quantitative Factors in Administration (3)
*Mgt 207: **Human Behavior in Organizations (3)**
Mgt 240: Survey of Information Technology (3)
Econ 220: Survey of Principles and Issues in Economics (3)
BAd 202: Business-Government Relations (3)
*BAd 233: **International Business Finance (3)**
BAd 248: **International Marketing (3)**
BAd 255: **Multinational Corporations in the World Economy (3)**
BAd 256: Seminar: International Trade (3)
*BAd 257: **Business Policy in the Multinational Firm (3)**
Elective: **To be selected with the approval of the advisor (3)**

*See departmental listings in this bulletin for prerequisite courses.

VIII. MANAGERIAL ACCOUNTING

Faculty Advisor: Anthony J. Mastro, Professor of Accounting, Government 302, Telephone 676-7335.

This area of concentration provides a knowledge of interrelated systems of accounting in planning and control for management. Emphasis is on the requirements of management for accounting information with concern for general and corporate accounting principles to the extent related to the managerial accounting functions.

Mgt 201:	Advanced Administrative Management (3)
Mgt 204:	Quantitative Factors in Administration (3)
*Mgt 207:	Human Behavior in Organizations (3)
Mgt 240:	Survey of Information Technology (3)
Econ 220:	Survey of Principles and Issues in Economics (3)
BAd 202:	Business-Government Relations (3)
*BAd 231:	Financial Decision-making (3)
*†Acct 215:	Management Accounting (3)
Acct 262:	Business Income Taxation (3)
*†Acct 275:	Contemporary Auditing Theory and Procedures (3)
*Acct 276:	Management Planning and Control (3)
*†Acct 282:	Accounting Information Systems (3)
*Acct 296:	Seminar in Accounting (3)

IX. PERSONNEL MANAGEMENT

Faculty Advisor: Roy B. Eastin, Professor of Business Administration, Government 311, Telephone 676-6063.

This area of concentration provides a basic academic and professional foundation, equipping the student for administrative responsibility in personnel management. The courses cover the fields of personnel management, industrial relations, unionism, collective bargaining, labor relations, and manpower development and utilization.

Mgt 201:	Advanced Administrative Management (3)
Mgt 204:	Quantitative Factors in Administration (3)
*Mgt 207:	Human Behavior in Organizations (3)
Mgt 240:	Survey of Information Technology (3)
Econ 220:	Survey of Principles and Issues in Economics (3)
BAd 202:	Business-Government Relations (3)
BAd 208:	Personnel Management and Industrial Relations (3)
BAd 209:	Seminar: Personnel Management (3)
BAd 212:	Unionism and Collective Bargaining (3)
*BAd 213:	Current Issues in Unionism, Collective Bargaining, and Labor Relations (3)
PAd 233:	Seminar: Manpower Development and Utilization (3)
Elective:	To be selected with the approval of the advisor (3)

* See departmental listings in this bulletin for prerequisite courses.

† If Acct 215 or a similar management accounting course has been taken prior to entrance into this program, students must take Acct 275 and Acct 282; if not, then students must take Acct 215 and either Acct 275 or Acct 282.

X. PROCUREMENT AND CONTRACTING

Faculty Advisor: Stanley N. Sherman, Associate Professor of Business Administration, Government 312, Telephone 676-7462.

This area of concentration provides a basic academic and professional foundation, equipping the student for administrative responsibility in procurement and contracting. The courses cover industrial purchasing, procurement activities of the federal government, and contracting activities of vendors to the federal government.

Mgt 201:	**Advanced Administrative Management (3)**
Econ 220:	**Survey of Principles and Issues in Economics (3)**
BAd 279:	Purchasing and Materials Management (3)
BAd 202:	**Business-Government Relations (3)**
Mgt 204:	Quantitative Factors in Administration (3)
Mgt 240:	**Survey of Information Technology (3)**
BAd 280:	**Procurement and Contracting (3)**
*Mgt 207:	Human Behavior in Organizations (3)
*BAd 282:	Government Contract Administration (3)
*BAd 283:	**Pricing and Negotiation (3)**
BAd 285:	Systems Procurement and Project Management (3)
Elective:	To be selected with the approval of the advisor (3)

XI. PUBLIC ADMINISTRATION

Faculty Advisors: David S. Brown, Professor of Management, Government 302, Telephone 676-6619; Stephen R. Chitwood, Associate Professor of Public Administration, Building D, Room 405, Telephone 676-6064.

This area of concentration provides a background in the basic fundamentals of public administration. The courses are designed to reflect the current theory as well as the practical and analytical concepts associated with the administration of governmental functions. As the student will note, the area of concentration focuses primarily on the federal government. An option addresses urban and regional administration.

Core Courses

Econ 220:	Survey of Principles and Issues in Economics (3)
Mgt 201:	**Advanced Administrative Management (3)**
Mgt 204:	Quantitative Factors in Administration (3)
*Mgt 207:	**Human Behavior in Organizations (3)**

Area of Concentration

PAd 210:	Concepts and Issues in Public Administration (3)
PAd 213:	Administration in the Federal Government (3)
PAd 223:	Behavioral Factors in Large and Complex Organizations (3)
PAd 245:	Intergovernmental Relations (3)
PAd 251:	**Governmental Budgeting (3)**
PAd 260:	Policy Formulation and Administration (3)
Electives:	**To be selected with the approval of the advisor (3)**

*See departmental listings in this bulletin for prerequisite courses.

Option in Urban and Regional Administration

To accommodate the needs of those students whose major interest is in urban and regional public administration, the following curriculum may be undertaken under special arrangements with the College of General Studies and the department of public administration.

PAd 210:	Concepts and Issues in Public Administration (3)
PAd 223:	Behavioral Factors in Large and Complex Organizations (3)
PAd 245:	Intergovernmental Relations (3)
PAd 248:	Financing Local Government (3)
PAd 249:	Urban Public Policy (3)
PAd 250:	Administration of State and Local Governments (3)
PAd 260:	Policy Formulation and Administration (3)
Elective:	To be selected with the approval of the advisor (3)

XII. QUANTITATIVE ANALYSIS FOR DECISION-MAKING

Faculty Advisor: William W. Hardgrave, Associate Professor of Management Science, Building Y, Room 20, 2131 G Street, N.W., Telephone 676-6852.

This area of concentration develops an understanding of quantitative approaches to problems of managerial control and decision-making. While the program will develop a competent background in basic mathematical theory associated with the various techniques, it is oriented towards applications of the techniques rather than their theoretical mathematical content.

Mgt 201:	Advanced Administrative Management (3)
*Mgt 207:	Human Behavior in Organizations (3)
Mgt 240:	Survey of Information Technology (3)
Econ 220:	Survey of Principles and Issues in Economics (3)
BAd 202:	Business-Government Relations (3)
*Mgt 225:	Managerial Statistics I (3)
*Mgt 226:	Managerial Statistics II (3)
*Mgt 227:	Mathematical Programming: Techniques and Applications (3)
*Mgt 228:	Techniques of Operations Research (3)
*Mgt 229:	Seminar: Management Science and Operations Research (3)
Electives:	To be selected from the following as approved by the advisor (6)
*BAd 225:	Seminar: Manufacturing Production (3)
*Mgt 242:	Comparative Computer Systems (3)
Mgt 260:	Introduction to General Systems and Cybernetics (3)

MASTER OF SCIENCE

The School of Engineering and Applied Science in cooperation with the National Aeronautics and Space Administration's Langley Research Center, Hampton, Virginia, has a graduate engineering program at NASA-Langley. NASA-Langley's extensive scientific and engineering facilities and equipment are available to students in this program.

The programs at NASA-Langley lead to the degree of Master of Science in the fields of acoustics, aeronautics, environmental modeling, structures and dynamics, flight sciences, fluid mechanics, and thermal sciences, solid mechanics,

* See departmental listings in this bulletin for prerequisite courses.

and materials engineering, electrical engineering, and computer science. These programs are open to qualified NASA employees and area residents. With the approval of the instructor, courses may be taken in nondegree status.

The School of Engineering and Applied Science in cooperation with the Naval Ship Research and Development Center, Carderock, Maryland, offers graduate courses leading to the degree of Master of Science in the field of ocean and marine engineering. The program is open to qualified NSRDC employees and area residents.

The School of Engineering and Applied Science has academic jurisdiction over these degree programs which are administered by the College of General Studies.

Admission

For detailed information see "Admission as a Degree Candidate," page 17, and pages 21–22.

Requirements for the Degree

The minimum program consists of 24 semester hours of approved graduate courses and a Master's thesis (equivalent to six semester hours). The student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses. All Master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Upon admission the student is assigned an advisor. Programs of study are determined by any prerequisites established and the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's advisor and the appropriate department chairman.

SCHOLARSHIP

For Master's work, a minimum of 24 semester hours (for those who receive credit for a thesis) or 33 semester hours (for those who follow the optional program without a thesis) of graduate course work with the grade of *B* or higher is required for graduation. Students who receive two grades of *F*, or three grades below *B*, are barred from further enrollment in graduate courses and, ordinarily, will not be readmitted to graduate study. Students who receive the grade of *C* in one or two courses are required to take additional course work to make up the minimum semester hours of work with grades of *B*.

INCOMPLETE AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 33.

Removing an Incomplete.—Although the grade of *I may* remain on the records for a minimum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by reregistering for the course here, or by taking

its equivalent elsewhere. An "Incomplete" which is not removed within one calendar year is automatically changed to an *F*.

RESIDENCE

In general, a minimum of one year of full-time study, or the equivalent in part-time study, must be completed in the School of Engineering and Applied Science.

MASTER'S THESIS

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate the ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate that the student can communicate the results of his or her work in writing. Work of a suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

As a part of registration for the thesis course 299, the candidate must submit to the appropriate department chairman (on the form obtainable at the School office) the thesis area, approved by the faculty advisor. The thesis title must be submitted to the dean, on the form available in the School office, at the beginning of the semester in which graduation is expected. Registration in thesis 299–300 entitles the student, during such registration, to the advice of the member of the faculty under whom the thesis is to be written. He may consult his advisor, but the thesis is the exclusive responsibility of the student.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis 300. In case a thesis is unfinished on the date specified, the student will be granted an additional semester and must pay the "Continuous Registration" fee (see page 37) unless registered for course work. If the preparation of the thesis extends beyond the three semsters, approval for an extension of time will be required and the student must reregister for thesis 300 and pay tuition as for a repeated course.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the School. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

OPTIONAL MASTER'S PROGRAM WITHOUT A THESIS

The student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses.

MASTER'S COMPREHENSIVE EXAMINATION

After completing the prescribed program, the candidate must pass a Master's Comprehensive Examination, to demonstrate substantial understanding of principles and method and their use in the area of interest. This examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined one more time if approval is given by the appropriate Examining Committee. In the event of failure to complete the examination satisfactorily, the student's graduate status terminates.

TIME TO COMPLETE MASTER'S DEGREE REQUIREMENTS

A full-time master's candidate is allowed a maximum of three calendar years to complete all degree requirements, from the date of his or her first graduate-student status registration in prerequisite or graduate courses. A part-time master's candidate is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Readmission is required upon expiration of leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman and approved by the dean.

MASTER OF ENGINEERING ADMINISTRATION

The School of Engineering and Applied Science, in cooperation with Aeronautical Radio, Inc., Annapolis, Maryland; the Fairfax County Government, Fairfax, Virginia; Hunt Valley Industrial Complex, Cockeysville, Maryland; and the Naval Ordnance Station, Indianhead, Maryland; offers a graduate program leading to the degree of Master of Engineering Administration. The program is open to employees of these organizations and area residents.

The School of Engineering and Applied Science has academic jurisdiction over this degree program which is administered by the College of General Studies.

Admission

For detailed information see "Admission as a Degree Candidate," page 17, and pages 21–22.

Requirements for the Degree

The requirements for the degree of Master of Engineering Administration are the same as those listed under the degree of Master of Science (see pages 78–81).

DOCTOR OF SCIENCE*

The Doctor of Science degree program offered by the School of Engineering and Applied Science is designed to prepare the student for a career of creative scholarship by providing a broad, balanced background of knowledge and guidance in the performance of research. It requires study of interrelated fields of learning as well as original research in the field of central interest. The doctoral program for each student is determined, on an individual basis, by the student and the advisor. Work for the doctoral degree must be done in residence on campus except when special permission is granted by the chairman of the department.

Admission

For detailed information see "Admission as a Degree Candidate," page 17, and page 23.

Requirements for the Degree

The program of study for the degree of Doctor of Science is divided into two stages. The first—made up of a study of interrelated fields of learning which supports the general area of research concentration—culminates in the qualifying examination. The second—composed of research investigation of a particular subject in a special field and the presentation of such research findings in a written dissertation—culminates in the final examination. The general requirements for the Doctor of Science degree are (1) a minimum of 30 semester hours of course work beyond the master's degree in preparation for the qualifying examination; (2) a reading knowledge of one foreign language, preferably Russian; (3) the satisfactory completion of the qualifying examination; (4) a dissertation, equivalent to a minimum of 24 semester hours; and (5) the satisfactory passing of the final oral examination.

The candidate must submit to the appropriate department five complete copies of the dissertation and two original copies of an abstract (not to exceed 600 words) of the dissertation no later than the date specified in the calendar. One copy of the abstract is for inclusion in the announcement of the examination and one for reproduction by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available at the School office. The successful candidate for the doctorate is required, prior to receiving the degree, to pay a fee to cover a part of the expense of printing the abstract of the dissertation, and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the University Library where bound copies are available for circulation.

LANGUAGE REQUIREMENT

A doctoral student must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign

* Complete information on the Doctor of Science degree program is contained in the *School of Engineering and Applied Science Bulletin.*

anguage, preferably Russian, must be demonstrated before admission to the ualifying examination. If the student wishes to satisfy this requirement with a anguage other than Russian, approval must be obtained from the doctoral adisor and the department chairman; permission to use a language other than ussian will be granted on the basis of its importance to the student's field of terest.

OOL REQUIREMENT

n addition to the language requirement, an examination in a tool requirement e.g., computer programming) may be established by the various departments.

CHOLARSHIP

o be admitted to the qualifying examination, the doctoral student must achieve n over-all academic average of 3.20 on a scale of 4 (a grade of *A* equals 4 oints; *B*, 3 points; *C*, 2 points; and *F*, 0 points). No doctoral student may reeive more than two course grades below *B*. If more than two course grades elow *B* are received, his graduate study is terminated and his further enrollent prohibited. Courses in which the student earns grades below *B* are not ncluded in the total semester-hour requirement for the degree. In the event a udent receives any grade below *B*, he or she is required to consult with the dvisor for a review of the program of study and discussion of possible changes herein.

PECIAL DEGREE PROGRAMS

aster of Arts in Special Studies (Criminal Justice)

program of study leading to the degree of Master of Arts in Special udies with a concentration in criminal justice is offered off campus by the raduate School of Arts and Sciences. This interdisciplinary degree program onsists of study in criminology, forensic sciences, law, management science, sychology, and sociology, and is particularly appropriate for law enforcement ersonnel or for students considering a career in law enforcement. For further nformation, contact one of the following: Charles E. O'Rear, Chairman of he Department of Forensic Sciences, telephone 676–7319; the Office of the ean of the Graduate School of Arts and Sciences, telephone 676–6210; or ollege of General Studies Staff Members—I. Ralph DeBelles, Director of istrict of Columbia Programs, telephone 676–7061; Douglas Carter, Director f Maryland Programs, telephone 676–7022; John A. Morrow, Director of rginia Programs, telephone 676–7040.

aster of Arts in Special Studies (Legislative Affairs)

program of study leading to the degree of Master of Arts in Special Studies ith a concentration in legislative affairs is offered off campus by the Graduate chool of Arts and Sciences. The program, focusing on the Congress of the nited States, includes course work in legislative theory and research, the proesses of politics, and public policy analysis. For further information, contact he Office of the Dean of the Graduate School of Arts and Sciences, telephone

676–6210, or James Halley, Associate Director of District of Columbia Programs, College of General Studies, telephone 676–7067.

Master of Arts in Special Studies (Social Policies)

A new program of study leading to the degree of Master of Arts in Special Studies with a concentration in Social Policies is offered off campus by the Graduate School of Arts and Sciences. This interdisciplinary program focuses on social insurance and the political process in the United States. It covers three major aspects of social policy: social insurance, macro- and micro-economics of social insurance, and the theory and practice of the U.S. political process. For further information contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210, or Anne Currier, Associate Director of Maryland Programs, College of General Studies, telephone 676–7249.

Master of Arts in Special Studies (Urban Learning)

The program of study leading to the degree of Master of Arts in Special Studies with a concentration in urban learning is offered off campus by the Graduate School of Arts and Sciences. The curriculum is designed to improve the urban educator's and city teacher's understanding of the environment in which he or she operates, with emphasis on social problems. For further information, contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210, or Norma Calhoun, Associate Director of District of Columbia Programs, College of General Studies, telephone 676–7023.

Master of Science in Administration

In cooperation with the Industrial College of the Armed Forces, Fort McNair, Washington, D.C., a program of study leading to the degree of Master of Science in Administration is offered by the School of Government and Business Administration. The program is open only to current students and faculty of the Industrial College of the Armed Forces. For further information, contact Harry R. Page, Faculty Advisor for the Industrial College of the Armed Forces Program, School of Government and Business Administration, telephone 676–6380, or LeRoy S. Paul, Associate Director of District of Columbia Programs, College of General Studies, telephone 676-7062.

Master of Science in Special Studies (Environmental Science)

A program of study leading to the degree of Master of Science in Special Studies with a concentration in environmental science is offered off campus by the Graduate School of Arts and Sciences. The curriculum is designed to improve the student's understanding of the environment in which he or she operates with emphasis on problems of the work place. It includes industrial hygiene and health, environmental impacts, economics and resource management, technology and public policy, and biostatistics. For further information contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210; or College of General Studies Staff Members—I. Ralph

DeBelles, Director of District of Columbia Programs, telephone 676–7061; Douglas Carter, Director of Maryland Programs, telephone 676–7022; John A. Morrow, Director of Virginia Programs, telephone 676–7040.

Master of Science in Special Studies (Oral Biology)

In cooperation with the Army Institute of Dental Research of the Walter Reed Army Medical Center, a program of study leading to the degree of Master of Science in Special Studies with a concentration in oral biology is offered by the Graduate School of Arts and Sciences. The program is open to dental officers serving on active duty with the U.S. Armed Forces or with other federal agencies. For further information, contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676-6210, or Edward B. Wright, Associate Director of Maryland Programs, College of General Studies, 676-7024.

Master of Science in Special Studies (Social and Economic Statistics)

A program of study leading to the degree of Master of Science in Special Studies with a concentration in social and economic statistics is offered off campus by the Graduate School of Arts and Sciences. The program is offered only to students at the International Statistical Program Center of the U.S. Bureau of the Census. It is designed to give a knowledge of the theories, concepts, principles, and literature of social and economic statistics, and background and management leadership in staff development as it relates to planning and implementation of statistical analyses. The curriculum includes demographic and statistical methods, management and organization, and economic and social development. For further information contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676-6210.

Master of Science in Special Studies (Telecommunication Operations)

A program of study leading to the degree of Master of Science in Special Studies with a concentration in telecommunication operations is offered off campus by the Graduate School of Arts and Sciences. This program is designed to introduce personnel with technical backgrounds in communications to related work in the field of business administration, economics, management science, political science, sociology, and statistics. For further information, contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210, or one of the following College of General Studies Staff Members—I. Ralph DeBelles, Director of District of Columbia Programs, telephone 676–7061; Douglas Carter, Director Maryland Programs, telephone 676–7022; John A. Morrow, Director of Virginia Programs, telephone 676–7040.

OFF-CAMPUS LOCATIONS OF THE COLLEGE OF GENERAL STUDIES

DISTRICT OF COLUMBIA

Bolling Air Force Base, Washington, D.C. 20332

Education Director: Edward Corbin
Office: Building 500
Telephone: 767-5348
Representative for the University: LeRoy S. Paul
Telephone: 676-7062
Open to military and civilian personnel

Federal After-hours Program

Representative for the University: Robert W. Stewart, Jr.
Telephone: 676-7018
Open to everyone

The following agencies participate in the Federal After-hours Program:

BUREAU OF CUSTOMS, WASHINGTON, D.C. 20229

James J. Doherty, Chief, Training and Career Development Branch
Office: Room 6320, 1301 Constitution Avenue, N.W.
Telephone: 964-8000

BUREAU OF DOMESTIC AND INTERNATIONAL BUSINESS, WASHINGTON, D.C. 20230

Education Director: Bruce Robinson, Chief, Employee Development Branch
Office: Room 3525, Commerce Department Building, 14th Street and Constitution Avenue, N.W.
Telephone: 967-7075 or 967-7076

DRUG ENFORCEMENT ADMINISTRATION, WASHINGTON, D.C. 20573

Education Director: Oscar Simon, In-Service Programs, National Training Institute
Office: Room 407, 1405 Eye Street, N.W.
Telephone: 382-4804

CIVIL SERVICE COMMISSION, WASHINGTON, D.C. 20415

For information contact Employee Development Officer, Personnel and Labor Relations Division
Office: Room 3H15, 1900 E Street, N.W.
Telephone: 632-5430

COAST GUARD, WASHINGTON, D.C. 20591

W.I. Barry, Chief, Training Section, Headquarters Civilian Personnel Branch (CAS-5/81)
Office: Room 8112B, Nassif Building, 400 7th Street, S.W.
Telephone: 426-2342

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Education Director: Thomas Tate
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Telephone: 632-6304 or 632-6385

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Training Officer: Joel B. Gerstle
Office: Room 6221, 18th and F Streets, N.W.
Telephone: 566-1279

INTERNAL REVENUE SERVICE, WASHINGTON, D.C. 20224

David C. Barry, Chief, National Office Training Branch
Office: Room 1313, 1111 Constitution Avenue, N.W.
Telephone: 566-1279

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Samuel D. Bingman, Jr., Director of Training
Office: Training Branch, Room 6363, 1200 Constitution Avenue, N.W.
Telephone: 275-7876

NATIONAL SCIENCE FOUNDATION, WASHINGTON, D.C. 20550

Career Development and Training Officer: H.F. Blackner
Office: 1800 G Street, N.W.
Telephone: 632-4106

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Telephone: 389-3101

Forrestal Building, L'Enfant Plaza, Washington, D.C. 20314

Education Director and Chairman of the Armed Forces Education and Training Advisory Council: Philip F. Strauss
Office: Room 3C147, Pentagon
Telephone: 697-8015 or 697-2823
Program Coordinators: Joe Aul, Dee Umlauf
Office: Room GE222, Forrestal Building
Telephone: 693-8484 or 693-8485
Representative for the University: William C. Robinson
Telephone: 676-7064
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Industrial College of the Armed Forces, Fort McNair, Washington, D.C. 20319

Coordinator: Bernard S. Waterman
Office: Room D–281, Industrial College of the Armed Forces
Telephone: 693-8507

Director for the University: Harry R. Page
Office: Room 308, Hall of Government, 710 21st Street, N.W.
Telephone: 676-7250
Representative for the University: LeRoy S. Paul
Telephone: 676-7062
Open to students and faculty of the Industrial College of the Armed Forces

Library of Congress, Washington, D.C.

Capitol Hill Graduate and Undergraduate Programs
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Naval Research Laboratory, Washington, D.C. 20032

Education Specialist: Sylvia Wahler
Office: Navy Research Laboratory, Bldg 72
Telephone: 767-2956
Representative for the University: LeRoy S. Paul
Telephone: 676-7062

Naval Security Station, 3801 Nebraska Avenue, N.W., Washington, D.C. 20390

Education Services Officer: Danny Snare
Telephone: 282-0860
Representative for the University: LeRoy S. Paul
Telephone: 676-7062

Naval Telecommunications Command, 4401 Massachusetts Avenue, N.W., Washington, D.C. 20370

Education Director: Allen Price
Telephone: 282-0371
Representative for the University: LeRoy S. Paul
Telephone: 676-7062

United States Army Institute of Dental Research Walter Reed Army Medical Center, Washington, D.C. 20012

Dr. William A. Ayer, Chief, Professional Development
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Telephone: 576-3443
Representative for the University: Edward B. Wright
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Walter Reed Army Medical Center, Washington, D.C. 20012

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Navy Campus for Achievement: Jan Goldstien
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Employee Development Officer: John Barber
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National Oceanic and Atmospheric Administration, Rockville, Md. 20852

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Office: Building 122
Telephone: 295-0064
Representative for the University: Edward B. Wright
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Open to military personnel assigned to duty and graduate study at the Naval Graduate Dental School

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Naval Ship Research and Development Center, Annapolis, Md. 21402

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Naval Ships Engineering Command (see Prince Georges Center Building)

Parklawn Building, Rockville, Md. 20852

Education Director: Gertrude Palder
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Representative for the University: Robert Engle
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Prince Georges Center Building (Naval Ships Engineering Center), Hyattsville, Md. 20788

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Telephone: 436-1104
Representative for the University: John Williams
Telephone: 676-7029
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Social Security Administration, Baltimore, Md. 21235

Director, Center for Continuing Education: Eric Levi
Office: Room 4-L-11, Annex Building, Division of Training and Career Development, 6401 Security Boulevard
Telephone: (301) 594-4529
Representative for the University: Anne Currier
Telephone: (202) 676-7249
Open to employees of the Social Security Administration and to others by permission

Suitland Federal Complex, DMA-Hydrographic Center, Suitland, Md. 20390

John Rea, Head, Training Branch
Office: Main Building, Room 140
Telephone: 763-1357
Representative for the University: Robert Engle
Telephone: (202) 676-7025

Westinghouse Defense and Electronic Systems Center, Baltimore, Md. 21203

Manager, Education and Technology Training: Stanley F. Black
Office: Baltimore-Washington International Airport, Box 1693
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Telephone: (202) 676-7024
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Telephone: 692-4476 or 692-4478
Employee Development Locations Served:

1. Ballston Towers #2, Room 1111, 692-4476
2. Jefferson Plaza #2, Room 158, 692-8524
3. Crystal Mall #3, Room 817, Patricia McGinnis, 697-4530
4. National Center #3, Room 4E66, Alex Lathers, 692-5610

Representative for the University: Herbert K. Berthold
Telephone: 676-7014
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Computer Sciences Corporation, 6565 Arlington Blvd., Falls Church, Va. 22042

Director, Industrial Relations: Dennis Sheehy
Representative for the University: Herbert K. Berthold
Telephone: 676-7014

Defense Supply Agency, Cameron Station, Alexandria, Va. 22314

Education Director: Philip C. Strang, Chief, Employee Development Branch
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Telephone: 274-7493
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Fairfax County Government, Fairfax, Va. 22030

Employee Training and Development Supervisor: Beverly Scott
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Telephone: 691-3437
Representative for the University: Gerry Bassett
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Fort Belvoir, Va. 22060

Education Director: Eric Eber
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Telephone: 676-7063
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Hoffman Building, 2461 Eisenhower Avenue, Alexandria, Va. 22314

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Office: Room 3C147, Pentagon
Telephone: 697-8015 or 697-2823
Building Administrator: John Rice
Office: Room 124, Hoffman Building
Telephone: 325-0150
Representative for the University: William C. Robinson
Telephone: 676-7064
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(University) 676-7064

Lynchburg Virginia Center, First and Merchants Bank Building, Room 606 Lynchburg, Virginia 24504

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Telephone: (804) 845-6035
Representative for the University: Barbara S. Framer
Telephone: (202) 676-7026

Nassif Building, 5611 Columbia Pike, Falls Church, Va. 22041

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Office: Room 734, Nassif Building
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The Pentagon, Washington, D.C. 20310

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Office: Room 3C147, Pentagon
Telephone: 697-2823 or 697-6805 or 697-8015

U.S. AIR FORCE

Education Officer: Edwin Corbin
Office: Room 5E410, Pentagon
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Pentagon Telephone: 697-3141
University Telephone: 676-7064
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Representative for the University: Barbara S. Framer
Telephone: 676-7026

Washington National Airport (FAA), Washington, D.C. 20001

Planning Development and Education Officer: William E. Freeman, Education and Training Office
Office: FAA Offices, Balcony, Main Terminal Building
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Representative for the University: Herbert K. Berthold
Telephone: 676-7014

Westgate/Westpark, Rt. 123 Tyson's Corner, McLean, Va. 22101

Representative for the University: Herbert K. Berthold
Telephone: 676-7014

West Springfield High School, 6100 Rolling Road, Springfield, Va. 22150

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DISTRICT OF COLUMBIA PUBLIC SCHOOLS

James T. Guines, Associate Superintendent of Instructional Services
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Telephone: 724-4175
Representative for the University: Norma L. Calhoun
Telephone: 676-7023

Charles Tri-County Center, Waldorf, Md. 20601

Maurice Dunkle, Program Counselor
Office: Thomas Stone High School
Telephone: (301) 843-6461

Representative for the University: Anne O. Currier
Telephone: (202) 676-7249

CALVERT COUNTY PUBLIC SCHOOLS, PRINCE FREDERICK, MD. 20678

David L. Brown, Supervisor of Personnel
Office: Calvert County School Board, Dares Beach Road
Telephone: (301) 535-1700

CHARLES COUNTY PUBLIC SCHOOLS, LA PLATA, MD. 20646

Elwood M. Leviner, Director of Personnel
Office: Charles County Board of Education, Health and Education Building
Telephone: (301) 934-4671

ST. MARY'S COUNTY PUBLIC SCHOOLS, LEONARDTOWN, MD. 20650

Kenneth D. Rigby, Personnel Assistant
Office: St. Mary's County School Board of Health Building
Telephone: (301) 475-9141

Dorchester County Public Schools, Cambridge, Md. 21613

John T. Comer, Assistant Superintendent for Personnel
Office: 403 High Street
Telephone: (301) 228-4747
Representative for the University: Anne O. Currier
Telephone: (202) 676-7249

Frederick Community College, Frederick, Md. 21701

Dr. Patrick Christoff, Dean, Office of Community Services
Telephone: (301) 662-0101
Representative for the University: Anne O. Currier
Telephone: (202) 676-7249

Prince Georges County Public Schools, Upper Marlboro, Md. 20870

Maurice Erly, Acting Director of Staff Development and In-Service Training
Office: Prince Georges County School Board
Telephone: 627-4800, Extension 218
Representative for the University: Anne O. Currier
Telephone: 676-7249

Talbot County Public Schools, Easton, Md. 21601

William F. Best, Assistant to the Superintendent
Office: Washington and Dover Streets
Telephone: (301) 822-0330
Representative for the University: Anne O. Currier
Telephone: (202) 676-7249

Wicomico County Public Schools, Salisbury, Md. 21801

William T. Middleton III, Director of Personnel
Office: Long Avenue and Mount Herman Road
Telephone: (301) 742-5128

Representative for the University: Anne O. Currier
Telephone: (202) 676-7249

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Fairfax County Public Schools, Fairfax, Va. 22150

William C. Symons, Jr., Staff Development Officer
Office: 10700 Page Avenue
Telephone: 691-3209
Representatives for the University: Gerry Bassett,
Telephone: 676-7249; John A. Morrow, Telephone: 676-7063

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George Washington University Tidewater Center: James Noel, Director
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Education Director: Michael A. Yannitello
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Fort Lee, Va. 23801

General Education Director: William Brantley
Telephone: (804) 734-2605

Fort Monroe, Va. 23351

Education Director: Al Hunter
Telephone: (804) 727-2454

Fort Story, Virginia Beach, Va. 23459

Education Director: E.F. Bolick
Telephone: (804) 422-7151

Guided Missile School/Fleet Anti-Air Warfare Training Center, Dam Neck, Virginia Beach, Va. 23461

Educational Advisor: William Eberling
Telephone: (804) 425-4473

Educational Director (Base): CWO3 R. Stoneking
Telephone: (804) 425-4184

Langley Air Force Base, Va. 23365

Education Services Officer: Robert J. Dewey
Telephone: (804) 764-5757

NASA-Langley Research Center, Langley Field, Hampton, Va. 23365

Head, Training and Education Services Branch: Malcolm P. Clark
Telephone: (804) 827-2611

Naval Air Station, Norfolk, Va. 23511

Educational Services Officer: Lt. J. McGalin, USN
Telephone: (804) 444-3291

Naval Air Station, Oceana, Virginia Beach, Va. 23460

Educational Services Officer,
Telephone: (804) 425-2613
NCFA: Alex Osborn
Telephone: (804) 425-2655

Naval Amphibious Base, Little Creek, Norfolk, Va. 23521

Educational Services Officer: STGCS W. C. Rowland
Telephone: (804) 464-7811

Naval Supply Center, Norfolk, Va. 23512

Training Director: George Green
Telephone: (804) 444-4912

U.S. Atlantic Fleet, U.S. Naval Base, Norfolk, Va. 23511

Educational Services Officer: TNI M. M. Yarbrough
Telephone: (804) 444-6945

U.S. Naval Regional Medical Center, Portsmouth, Va. 23708

Training Officer: Eugene Rogers
Telephone: (804) 397-6541, Extension 561

U.S. Naval Station, Norfolk, Va. 23511

NCFA: Billy Bishop
Telephone: (804) 444-7272

COURSES OF INSTRUCTION

THE FOLLOWING PAGES CONTAIN LISTINGS AND DESCRIPTIONS of courses offered by the departments of instruction and special interdepartmental programs. Courses carrying the designation "Campus Course" are normally offered only on campus. The courses as here listed are subject to change. The University reserves the right to withdraw any course announced.

EXPLANATION OF COURSE NUMBERS

COLLEGES AND SCHOOLS OTHER THAN ENGINEERING AND APPLIED SCIENCE

First-group courses.—Courses numbered from 1 to 100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

Second-group courses.—Courses numbered from 101 to 200 are planned for students in the junior and senior years. Except for accounting courses, they may be taken for graduate credit only upon the approval of the dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work in order to receive graduate credit. Accounting courses numbered 101–200 may not be taken for graduate credit.

Third-group courses.—Courses numbered above 200 are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors registering for Accounting, Business Administration, Health Care Administration, Management Science, or Public Administration courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course, the prior approval of the faculty advisor, and the prior approval of the Dean of the School of Government and Business Administration. Nondegree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Courses numbered from 1 through 199 are planned for undergraduate credit, although certain courses may be taken for graduate credit when arrangements are approved in advance by the instructor and the dean. Courses numbered 201 to 300 are planned for graduate credit and may in certain instances be taken by qualified undergraduate students. Courses numbered from 301 to 400 are primarily for doctoral students.

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving three semester hours of credit each semester is marked (3–3), and a semester course giving three semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
HCA	Health Care Administration
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAF	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
LEnf	Law Enforcement
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opth	Ophthalmology
Oral	Oral Biology
Orth	Orthopaedic Surgery

Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
Rad	Radiology
Rel	Religion
SLP	Service Learning Program
SPSc	Service-Learning Political Science
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Operations
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies



Accounting

Chairman: A.J. Mastro, Professor of Accounting; Government 202, Telephone 76-6825

Accounting courses numbered below the 200 level may not be taken for graduate credit. Accounting courses numbered 201 and above may not be taken for undergraduate credit.

1–2 Introductory Accounting (3–3)

Basic understanding of accounting concepts, procedures, analyses, and reports; the accounting measurement and communications of significant economic and financial data. Prerequisite to Acct 2: Acct 1. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 1.

101 Cost and Budgetary Control (3)

Cost behavior and volume-profit relationships, responsibility accounting, standard costs, flexible budgets, cost structures for control and motivation, relevant costs, cost concepts. Prerequisite: Acct 1–2. Students who have received credit for Acct 193 or 215 cannot receive credit for Acct 101.

111 Financial Statement Analysis (3)

Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Acct 1–2.

115 Financial Accounting (3)

Role of accounting in the decision-making of external parties; understanding, interpretation, and implementation of financial accounting. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 115.

121 Intermediate Accounting (3)

In-depth study of accounting functions and basic theory; acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Acct 1–2.

132 Accounting Theory (3)

Current thought as reflected in the pronouncements of leading professional and accounting research associations, major contributions to accounting literature. Prerequisite: Acct 121.

141 Governmental Accounting (3)

Appropriation, encumbrance, and fund accounting for governmental and institutional entities. Prerequisite: Acct 1–2.

161 Federal Income Taxation (3)

Federal income tax concepts applicable to individuals and corporations, differences between tax accounting and financial accounting.

171 Auditing (3)

Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, form-preparation-use of audit work papers, audit evidence. Prerequisite: Acct 121.

181 **Accounting Systems** (3)

Organization and use of accounting information: origination, classification, control, and reporting; development, design, and installation of accounting systems; accounting communication patterns. Prerequisite: Acct 101, 171.

191 **Advanced Accounting** (3)

Application of accounting theory to special areas: consolidated statements, business combinations, earnings per share, foreign exchange, price-level adjusted statements, source and application of funds. Prerequisite: Acct 121.

193 **Business Budgeting** (3)

Principles and procedures in the development, installation, and operation of a system of budgetary control to aid management. Prerequisite: Acct 1–2. Students who have received credit for Acct 101 cannot receive credit for Acct 193.

215 **Management Accounting** (3)

Role of accounting in management decision-making processes; understanding of accounting influences on resource allocation decisions in the organization. Prerequisite: Acct 115 or a similar financial accounting course. Students who have received credit for a similar management accounting course cannot receive credit for Acct 215.

262 **Business Income Taxation** (3)

Federal income tax concepts applicable to corporations, partnerships, and their owners; emphasis on tax planning factors in business decisions and tax research.

275 **Contemporary Auditing Theory and Procedures** (3)

Study of auditing concepts: generally accepted auditing standards, application of statistical sampling to auditing, audit of electronic data processing systems. Prerequisite: Acct 115 and 215, or equivalent.

276 **Management Planning and Control** (3)

Integrative case study approach to management systems for planning, control, and decisions: value indices for organizational subunits, transfer pricing, contemporary control systems, accounting framework and cycle. Prerequisite: Acct 115 and 215, or equivalent.

282 **Accounting Information Systems** (3)

Development and application of accounting system theory, including analysis, design, and implementation. Integration of automatic data processing, accounting systems, and management information systems. Prerequisite: Acct 115 and 215, or equivalent.

296 **Seminar in Accounting** (3)

Selected accounting studies: critical analysis and evaluation developed in seminar discussions and papers. Prerequisite: Acct 115 and 215, or equivalent.

American Civilization*

Director: B.M. Mergen, Associate Professor of American Civilization, P-101, Telephone 676-6070

71–72 **Introduction to American Civilization** (3–3) (Campus Course)

Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance.

†192 **The American Cinema** (3)

History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture.

‡197 **Oral History and Interview Techniques** (4)

Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area.

271 **Seminar: Scope and Methods in American Studies** (3)

Consideration of American studies as an area for research and teaching; introduction to bibliography.

Anthropology

Chairman: R.L. Humphrey, Jr., Associate Professor of Anthropology; X-11, Telephone 676-6075

Departmental prerequisite: Anth 1–2 is prerequisite to all other courses in Anthropology. This prerequisite may be waived by permission of instructor.

1–2 **Introductory Anthropology** (3–3)

Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior.

154 **Mythology and Folklore** (3)

Traditional verbal expression of supernatural or social beliefs; metaphorical thought; verbal art.

155 **Primitive Religion** (3)

Conceptions of the supernatural in nonliterate societies. Religious beliefs and practices. Emphasis on religious process and change.

157 **Primitive Social Organization** (3)

Analysis of the social organization of primitive peoples; kinship, economic, and political systems.

* Administered by the American Studies Program.
† Joint offering of the American Studies Program and the department of Speech and Drama.
‡ Joint offering of the American Studies Program and the department of History.

171 **Native Peoples of North America** (3)
Comparative study of Indian groups representative of each of the continent's culture areas.

185 **Latin American Archeology** (3)
Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest, emphasizing the origin and development of Latin American high civilizations.

201 **Seminar: the Nature and Scope of Anthropology** (3)
Survey of the development of anthropological thought; examination of the subject matter, methodology, and theoretical approaches of anthropology, especially as they relate to contemporary societies.

202 **Seminar: Recent Trends in Anthropology** (3)
Major topics of interest in contemporary anthropology since the mid-20th century will be taken up in order, stressing current journal and monograph materials.

Art

Chairman: L.F. Robinson, Associate Professor of Art; Building H, Telephone 676-6085

31–32 **Survey of Western Art** (3–3)
A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art.

71–72 **Introduction to the Arts in America** (3–3)
Art 71: from colonial beginnings to the republican age. Art 72: from 19th century to the present.

109 **19th Century Art in Europe** (3)

110 **Contemporary Art** (3)

112 **Art of Egypt and the Ancient Orient** (3)
Study of the art of Mesopotamia, Anatolia, Egypt, and Persia.

113 **Baroque Art in Italy** (3)

115 **Christian Iconography** (3)
Origins and development of Christian symbols and themes from early Christian to modern times.

117 **Medieval Art I** (3)
Early Christian and Byzantine.

120 **Art of China and Japan** (3)

129–30 **Principles of Museum Work** (3–3)
Introduction to the history and development of museums; problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service.

141 **Interior Design** (3)
Principles of decoration dealing with furniture designs and ensemble layout, draperies, color, accessories, and lighting.

145 **Folk Arts in America** (3)
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.

155 **Etruscan Art and Archeology** (6)
Art and Archeology Program in Italy.

203 **Primitive Art** (3)

242 **Etruscan Art and Archeology** (6)
Art and Archeology Program in Italy.

Biological Sciences

Chairman: A.H. Desmond, Professor of Zoology; Bell 314, Telephone 676-6090

BIOLOGY

3–4 **Introductory Biology for Nonscience Majors** (3–3) (Campus Course)
Lecture (2 hours), laboratory (2 hours). Survey of biological principles; emphasis on man as a functional organism in his environment. Prerequisite to BiSc 4: BiSc 3. Material fee, $15 a semester.

11–12 **Introductory Biology for Science Majors** (4–4) (Campus Course)
Lecture (3 hours), laboratory (3 hours). Biological principles and problems designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $18 a semester.

Business Administration

Chairman: S.F. Divita, Associate Professor of Business Administration; Government 302, Telephone 676-6115

51 **Introduction to Business** (3)
Structure, activities, and problems of business enterprise; its contribution to the individual and to society; careers in business.

101 **The Business Environment** (3)
Economic and legal environment of business enterprise; social and political influences; contemporary problems and issues.

102 **Fundamentals of Management** (3)
Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking.

105 **Personnel Management** (3)
The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities.

106 **Leadership in Personnel Management** (3)

A study of the philosophy, principles, policies, and programs for effective personnel management and industrial relations as portrayed by case studies drawn from business and government. Prerequisite: BAd 105 or permission of instructor.

107 **Collective Bargaining** (3)

American unionism and collective bargaining; economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 105 or permission of instructor.

113 **Real Estate** (3)

Principles of urban real estate practice; leasing and property management, valuation, appraisal, financing, taxation, urban growth, urban renewal.

121 **Fundamentals of Insurance and Risk Management** (3)

Function of insurance and risk management in business enterprise.

122 **Insurance and Estate Planning** (3)

Insurance and estate programming in providing protection and estate development; disposition of the individual estate.

131 **Business Finance** (3)

Analyzing capital requirements and methods of acquiring funds; planning efficient use of capital. Asset management, financial analysis, sources of funds, capital budgeting, stockholder relationships. Prerequisite: Acct 1–2; Econ 1; Math 30, 31; Stat 51.

132 **International Business Finance** (3)

Principles, practices, problems, and institutions of international finance. Emphasis on international financial markets, exchange rates, balance-of-payments restraints, and governmental policies. Prerequisite: BAd 131.

138 **Investment and Portfolio Management** (3)

Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security markets. Risk-reward and computer-aided analysis. Prerequisite: Acct 1–2; BAd 131.

141 **Basic Marketing Management** (3)

Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1–2.

143 **Marketing Research** (3)

Basic methods and techniques of marketing research, problem definition, data collection, market survey and experimental design, data analysis and presentation. Special topics: attitude research, questionnaire construction and concept testing. Prerequisite: BAd 141.

158 **Physical Distribution Management** (3)

Logistical considerations of plant, warehouse and store location, inventory control, warehousing and transportation planning. Channels of distribution from an institutional-behavioral viewpoint. Design, management and evaluation of the distribution system. Prerequisite: Econ 1–2.

161 **Commercial Law** (3)

Fundamental concepts and principles of law encountered in business activity; contracts, bailments, agency, sales, negotiable instruments, bankruptcy, other topics. Basic legal considerations in business decision-making.

171 **Principles of Transportation** (3)

Impact of intercity transportation systems on society. Emphasis on modal differences in development, economic characteristics, and regulation. Prerequisite: Econ 1–2.

172 **Public Utilities** (3)

Legal and economic meaning of public utility concept; development, services, economic characteristics, rate-making, and regulation with emphasis on electric, gas, and telephone industries. Prerequisite: Econ 1–2.

173 **Transportation Systems Management** (3)

Comparative study, from the standpoint of various carrier modes, of management problems common to all modes of domestic and international transportation. Prerequisite: BAd 171; Econ 1–2.

174 **Urban Transportation** (3)

Problems of developing balanced transportation systems for urban areas—area needs, modal evaluation, cost effectiveness, finance, and marketing. Prerequisite: BAd 171, Econ 1–2; or equivalent.

175 **Introduction to International Business** (3)

Terminology; trade usages and practices; physical movement of goods in international business; conditions essential for successful trading; export shipment, documentation, procedural problems.

178 **International Business Policy and Operations** (3)

Analysis of overseas projects according to purpose and type of organization; development and management of overseas operations in different world areas. Prerequisite: BAd 175 or permission of instructor.

181 **Manufacturing Production** (3)

Basic principles and methods of manufacturing production. Manufacturing facilities, plant and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent.

198 **Business Policy and Administration** (3)

Terminal undergraduate course in business administration. Integration of functional activities in arriving at overall business policy decisions. Prerequisite: BAd 102, 105, 131, 141, 181.

202 **Business-Government Relations** (3)

Regulatory and promotional activities of the government, independent regulatory agencies, antitrust activities, monetary and fiscal policy, regulation of labor-management relations.

208 **Personnel Management and Industrial Relations** (3)

Survey of personnel management practices and procedures, including labor-management relations.

209 **Seminar: Personnel Management** (3)

Industrial personnel and manpower management, research in advanced problems.

211 **Leadership and Executive Development** (3)

Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels; executive selection and development. Prerequisite: Mgt 201 or permission of instructor.

212 **Unionism and Collective Bargaining** (3)

The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements.

213 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3)

Current problems and issues. Prerequisite: BAd 212.

220 **Administration of Research and Development** (3)

Examination of technological, political, and economic factors affecting the R&D environment; operational aspects; management problems in military, governmental, and industrial organizations; project selection, resource allocation, personnel, planning and control, measurement and evaluation.

222 **International Research and Development** (3)

Technological, political, social, and economic factors affecting international R&D policy; problems in industrial, governmental, and international organizations; world technological forecasting; resource allocation; technology transfer. Prerequisite: BAd 220 or permission of instructor.

223–24 **Technology Assessment Theory and Practice** (3–3)

BAd 223: the technology assessment concept. Methods for conducting assessments. Management of assessments. Evaluation of selected assessments. BAd 224: planning and conducting a technology assessment. Prerequisite to BAd 224: BAd 223 or permission of instructor.

225 **Seminar: Manufacturing Production** (3)

Production technology, including new processes, materials, products, equipment, and facilities. Implications of emerging technology in managing the production function. Prerequisite: BAd 181 or permission of instructor.

229 **Seminar: Administration of Research and Development** (3)

Individual and/or group in-depth research projects dealing with various phases of research and development management. Topic will vary each time the course is offered according to the emerging technology, current operational problems, and student interest. Prerequisite: six to nine semester hours of research and development management or permission of instructor.

231 **Financial Decision-making** (3)

Functions and objectives of financial management, asset management, problems of internal financial analysis, rate-of-return analysis, financial forecasting, problems of capital demand and supply. Prerequisite: BAd 131.

232 **Capital Resource Management** (3)

Problems and theory of capital acquisition and allocation. Prerequisite: BAd 231.

233 **International Business Finance** (3)

Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 131 or equivalent.

234 **Seminar: Capital Formation** (3)

Determinants of saving and investment, timing of corporate security issues, analysis of current capital market conditions. Prerequisite: BAd 131 or equivalent.

235 **Financial Management** (3)

Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 231.

237 **Investment Analysis** (3)

Risk-reward analysis of security investments including analysis of national economy, industry, company, and market; introduction to portfolio management; emphasis on theory and computer methods. Prerequisite: BAd 131.

238 **Seminar: Investment and Portfolio Management** (3)

Portfolio management theory, application, and computer modeling. Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. Prerequisite: BAd 237.

241 **Marketing Management** (3)

Marketing management problems; market segmentation, product planning, channels of distribution, advertising, personal selling, sales promotion, pricing and development of integrated marketing programs.

243 **Seminar: Marketing Research** (3)

Research as an aid to decision-making and increased efficiency in marketing, marketing research process, critical appraisal of methods and results, applications.

248 **International Marketing** (3)

Organization for international marketing, demand analysis, product development and policies, marketing structure and trade channels, advertising and promotion problems and policies, pricing, and legal aspects. Effective international marketing strategy.

255 **Multinational Corporations in the World Economy** (3)

Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strategies, relationships to other nations; national and international controls; future of the multinational corporation.

256 **Seminar: International Trade** (3)

Classical and modern concepts of international trade theory, instruments and institutions of trade policy, barriers to trade, preferential treatment and trading blocs, trends and issues.

257 **Business Policy in the Multinational Firm** (3)

International market entry and expansion; operating policies, procedures, and problems of multinational companies; developing executives for international business. Prerequisite: advanced master's degree standing.

261 **Applied Microeconomics** (3)

Applications of economic theory and statistics to business decisions involving demand, production, cost, profits, investments, and inventories. Prerequisite: Econ 217, Mgt 203, Stat 111; or equivalent; or permission of instructor.

262 **Applied Macroeconomics** (3)

Use of economic theory and statistics in business forecasting; interpretation of economic trends and developments; analysis of governmental economic policies. Prerequisite: Econ 218, Mgt 203, Stat 111; or equivalent; or permission of instructor.

275 **Seminar: Transportation** (3)

Problems and special areas of interest in transportation. Prerequisite: BAd 171 or permission of instructor.

279 **Purchasing and Materials Management** (3)

Industrial purchasing and materials management principles and practices. Organization and functions in materials management. Determination of requirements, source selection, buying practices, policies, and ethics.

280 **Procurement and Contracting** (3)

Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector.

282 **Government Contract Administration** (3)

Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes, negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Prerequisite: BAd 280 or permission of instructor.

283 **Pricing and Negotiation** (3)

Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Prerequisite: BAd 280 or permission of instructor.

285 **Systems Procurement and Project Management** (3)

Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans procurement processes. Developing adequate intercontractual business relationships within the environment of public procurement. Management of projects under contract.

295 **Research Methods** (3)

Same as Mgt 295 and PAd 295. Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings.

297 **Business Policy Formulation** (3)

Analysis of operational situations and policy issues. Developing and implementing solutions to managerial problems. Prerequisite: advanced master's degree standing.

299 **Thesis Seminar** (3) (Campus Course)

Examination of thesis standards, research philosophy and methodology.

300 **Thesis Research** (3)

Cartography*

Program Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography, Telephone 676-7000 or 946-3557

1 **Cartography I** (3)

Introduction to the fundamental concepts and practical applications of cartography. Prerequisite: Math 3, 6, or equivalent.

2 **Cartography II** (3)

Aerial photography, modern topographic and hydrographic mapping and charting, thematic maps, map reliability, planning and design and reproduction. Prerequisite: Cart I.

102 **Elements of Remote Sensing** (3)

Basic elements of remote sensing. Emphasis on the electromagnetic spectrum, infrared photographic systems, thermal systems, and analysis of multispectral photography and thermal imagery. General characteristics of satellite remote sensing. Prerequisite: Cart 1 and 2 (or equivalent experience), Geod 17, and Math 30.

104 **Photo-interpretation** (3)

Interpretation of topographic, vegetative, hydrologic, and man-made features. Civil and military applications. Applications to urban planning and urban-industrial patterns. Use of satellite imagery and remote sensing data. Color aerial photographs and underwater photography. Prerequisite: Cart 102, Geod 17, Math 30; or permission of instructor.

107 **Physiography** (3)

Development of physiographic concepts; the earth's crust, weathering, climate, and denudation; stream, shore, wind, and ice processes; glaciation; physiographic regions.

108 **Climatology** (3)

Causes for climate and weather, air mass movements, water mass movements, physical features of boundaries. Tropics, subtropics, humid and dry continentals, subarctics.

111 **Cartographic Techniques** (3)

Techniques and procedures, field methods, evaluation of source material, use of scribing and contact screens in color separation, shaded relief,

* Affiliated with the Department of Geography and Regional Science.

and reproduction. Lectures and laboratory. Laboratory fee to be announced. Prerequisite: Cart 2, Geod 12, Math 3, 6 (or equivalent experience).

113 Map Design (3)

Functional requirements of various kinds of maps. Principles of human perception and visual communication. Influence of reproduction processes on map design. Optimizing results within constraints of available source material, equipment, time, money, manpower, and reproduction process. Changing tradition of map design. Influence of experimental work and progress in the commercial and fine arts on map design. Role of map design in mapping organizations. Prerequisite: Cart 107, 108, and 111.

115 Cartometrics I (3)

Examination of the application of automatic computing systems to cartography. Course will cover batch processing and time sharing and dedicated mini-computer systems as well as digitigers, plotters, and graphic terminals. Prerequisite: Cart 1, 2.

116 Cartometrics II (3)

Analysis of cartographic computing programs, cartographic data structures and automated mapping data bases. Examination of FORTRAN programming methods as they apply to cartography. Preparation of coordinate transformation programs, map projection programs, and plotting software. Prerequisite: Cart 115; Stat 97 or 106; or equivalent experience. Laboratory fee for computer use, $60. Checks must be made payable to the Utility Network of America.

120 Computer Mapping I (3)

The analysis and application of computer mapping methods consisting of the techniques for the automation of data bases and the creation of computer generated map output. Course utilizes the Harvard SYMAP program and students will develop application programs in laboratory sessions. Prerequisite: Cart 115, 116. Laboratory fee for computer use, $60. Checks must be made payable to the Utility Network of America.

121 Computer Mapping II (3)

Study of advanced applications of SYMAP properties and application of programs other than SYMAP that include 2- and 3-dimensional automated plotter programs. Course will include laboratory sessions and students will develop an advanced seminar project. Prerequisite: Cart 120. Laboratory fee for computer use, $60. Checks must be made payable to the Utility Network of America.

125 Marine Cartography (3)

Exploring the extended and imaginative symbology required to depict a visually opaque environment characterized by sparsity of data; the thermatic aspects of oceanographic mapping. Prerequisite: Cart 2.

126 Topographic Mapping (3)

The application of control surveys and photogrammetry to topographic mapping. National Map Accuracy Standards. Systematic application of geographic names. Field completion. Feature classification and symbolization. Map compilation and color separation. Comparison of American and foreign topographic maps and methodologies. Prerequisite: Cart 107, 111; Geod 12, 13.

128 **Thematic Mapping** (3)

Analysis of the thematic map as a means of communicating qualitative and quantitative data. The function and design of base maps for thematic overprints. Source material research, analysis and manipulation. Map layout and symbol design. Experimental studies to compare the data the cartographer intends to communicate with the map and that actually extracted by the reader. Prerequisite: Math 30; Cart 111; and Stat 91 or 107.

131 **Techniques in Remote Sensing** (3)

The application of remote sensing to earth resource studies with emphasis on the physical characteristics of electromagnetic radiation, multispectral sensing, and photographic and digital image analysis. Satellite systems and the cartographic treatment of remote sensing data. Prerequisite: Cart 102; Math 31; and Phys 1 or 3.

135 **Cartographic Photography and Printing** (3)

Historical development of map printing since the introduction of photography. Comparison of printing processes. Contact and camera photography. Light sources for the darkroom and exposure. Photographic emulsions, sensitometry and densitometry. Phototypography. Comparison of color-proofing methods. Registration systems. Plate making, press work. Preparation of specifications for contractual printing. Quality control and other managerial problems. Prerequisite: Cart 111.

140 **Sensitometry of Photomapping** (3)

Construction of tone reproduction curves; optimization of photographic presentation; evaluation of photo materials, equipment and systems. Prerequisite: Math 30, Phys 1, or equivalent experience.

142 **Mechanics and Kinetics of the Photographic Process** (3)

Light, optics and photometry as applied to the photographic process; sensitometry and densitometry for quality control and assurance; density slicing; image enhancement; auto- and self-dodging; antivegnetting masks.

Chemistry

Chairman: R.E. Wood, Professor of Chemistry, Corcoran 105, Telephone 676-6120

PHYSICAL SCIENCE

3–4 Contemporary Science for Nonscience Majors (3–3)
(Campus Course)
(Formerly Contemporary Science)

Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological, and medical science. Chem 3 is not prerequisite to Chem 4 but both courses must be satisfactorily completed to fulfill the meaningful initiation requirement. Laboratory fee, $20 per semester.

5–6 Contemporary Science (4–4)

Nonlaboratory course for off-campus students only. Survey covering topics in contemporary science: population control, pollution, drugs, food additives, etc.

CHEMISTRY

8 Physiological Chemistry (2)

Chemical aspects of selected topics in human physiology. Does not satisfy either premedical or course requirements for the chemistry major. A chemistry elective for students in allied health sciences.

9 General Chemistry (4)

Same as Chem 11, for off-campus students only.

11–12 General Chemistry (4–4) (Campus Course)

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $28 per semester.

201 Environmental Science and Technology (3)

Chemistry and physics of environmental pollution; emphasis on water and air pollution. Instrumental techniques and their limitations. Students present papers emphasizing chemical and physical aspects of an environmental pollutant.

Chinese*

Chairman: C. Shih, Professor of Chinese; Library 613, Telephone 676-7106

1–2 Beginning Mandarin Chinese, Level I (3–3) (Campus Course)

Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $17.50 per semester.

3–4 Beginning Mandarin Chinese, Level II (3–3) (Campus Course)

Classroom (3 hours), laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $17.50 per semester.

13–14 Reading Chinese for Beginners (4–4) (Campus Course)

Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for graduate students wishing to acquire a reading knowledge without learning to speak or write the language.

Economics

Chairman: M.A. Holman, Professor of Economics; C-617, Telephone 676-6150

Departmental prerequisite: Econ 1–2 is prerequisite to all courses in Economics except for Econ 217–18 and 220.

* Administered by the Department of East Asian Languages and Literatures.

1–2 Principles of Economics (3–3)

Lecture (2 hours), recitation (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics. Econ 2: microeconomics.

101 Intermediate Microeconomic Theory (3)

Analysis of supply, demand, and pricing.

102 Intermediate Macroeconomic Theory (3)

Theories of national income determination and growth.

121 Money and Banking (3)

Nature of money, credit, commercial banking, and other financial institutions in the U.S. monetary system.

217–18 Survey of Economics (3–3)

For graduate students in fields other than economics. Econ 217: price theory. Econ 218: income and employment theory. Departmental prerequisite waived.

220 Survey of Principles and Issues in Economics (3)

Survey of economic theory and its application to contemporary economic problems. Departmental prerequisite waived.

236 Seminar: Economics of the Environment and Natural Resources (3)

Analysis of public policy problems relating to the environment and natural resources development and management.

241–42 Labor Economics (3–3)

Theory of wages and employment, analysis of labor supply and demand. Structural unemployment; occupational choice; labor market discrimination.

243 Seminar: Manpower Policy (3)

Developments leading to expansion of public investment in manpower resources; evaluation of goals and operations of publicly supported programs. Open to undergraduates.

247 Seminar: Industrial Organization (3)

Selected topics in regulatory economics and in antitrust economics during alternate years. Topic for 1978: antitrust problems. Prerequisite: Econ 101 or equivalent.

253 Productivity Analysis (3)

Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels.

259 Income Distribution (3)

Theoretical and empirical analysis of income distribution, including analysis of policies related to income inequality. Open to advanced undergraduate economics majors.

Education

Chairman: Donald Linkowski, Associate Professor of Education; C-514, Telephone 676-6940

Departmental prerequisite: A degree from an accredited institution and adequate professional preparation are prerequisite to courses in Education numbered from 201 to 400.

100 **Special Workshop in Education** (arr.)

Topics to be announced in *Schedule of Classes.* May be repeated for credit.

112 **Educational Measurement** (3)

Basic measurement techniques: selection, administration, and interpretation of standardized tests; test construction and statistical analysis of test results.

115 **Experimental Course** (arr.)

Courses being offered for the first or second time. Topics to be announced in *Schedule of Classes.* May be repeated for credit.

128 **Children's Literature** (3)

Lecture (2 hours), field work (2 hours). Newer books for children and the children's classics, contribution of literature to child development.

133 **Supervised Experience in Education** (3 to 6)

Field work, internship, and instructional practice: 1. adult education and human resource development; 2. college student development experience; 3. higher education; 4. museum education; 5. counseling. Admission by permission of instructor.

200 **Special Workshop in Education** (arr.)

Topics to be announced in *Schedule of Classes.* May be repeated for credit.

205–6 **The Curriculum** (3–3)

For experienced teachers. Educ 205: curriculum foundations and issues, comparison of curriculum patterns. Educ 206: curriculum development in subject areas, group consideration of student problems.

207 **Curriculum Materials** (3 to 6)

For experienced teachers. Construction of courses of study and classroom teaching aids, with direct application to students' situations.

208 **Human Development** (3)

Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research.

209 **Child Development** (3)

Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood.

210 **Adolescent Development** (3)
Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence.

212 **Quantitative Methods I: Introduction to Survey Measurement and Evaluation** (3)
Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data-gathering techniques and descriptive statistics.

213–14 **History of Education** (3–3)
Educ 213: European origins of American education. Educ 214: evolution of the American school system.

215 **Experimental Course** (arr.)
announced in *Schedule of Classes*. May be repeated for credit.
New courses being offered for the first or second time. Topics to be

217–18 **Philosophy of Education** (3–3)
Educ 217: to help students formulate a personal philosophy of education. Educ 218: social foundations of education—forces that shape policies and offerings of the school.

219 **Elementary School Classroom Procedures** (3)
Current theories of teaching and learning and their application to teaching strategies of elementary school teachers.

222 **Foundations of Reading Instruction—Early Childhood and Elementary School** (3)
Historical and psychological background; readiness, special approaches and skills for beginning and elementary readers; evaluation of materials; demonstrations of diagnostic and instructional techniques.

223 **Foundations of Reading Instruction—Intermediate and Secondary** (3)
Historical and psychological background; evaluation of recent methods, materials, and techniques in teaching reading; demonstrations of diagnostic and teaching techniques.

224 **Diagnostic Teaching of Reading** (3)
Classroom diagnostic and instructional techniques for elementary school level; construction of informal tests; administration and interpretation of informal and standardized tests; study of materials and application of readability formulas. Prerequisite: at least one previous course in reading instruction.

226 **Reading in Secondary School** (3)
Methods, techniques, and materials necessary for testing and developing efficient reading skills, including skills in content subjects; organizing and evaluating reading programs.

227 **Basic Issues in Elementary Education** (3)
Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school.

228 **Instructional Areas in Elementary Education** (3)

Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education.

231 **Secondary School Classroom Procedures** (3)

Current classroom practices: teacher-pupil planning, group procedures, initiatory and culminating activities, individual and group evaluation techniques, teaching aids, etc.; review of recent literature.

233 **Audio-visual Education** (3)

Lecture (2 hours), laboratory (1 hour). Selection, evaluation, and use of audio-visual materials; administrative problems in care, operation, maintenance, and use of such materials and equipment. Material fee, $7.

235 **Analysis of Teaching** (3)

Teaching as work: diagnosing learning skills, program planning and implementation, feedback information on both student and program.

236 **Introduction to Education Technology** (3)

Consideration of historical perspective, process, instrumentation, and implementation of self-instructional systems.

237 **Systems Approach to Instructional Design** (3)

Application of systems techniques to the development of an instructional program.

241 **Education of the Gifted** (3)

For classroom teachers. Nature and discovery of giftedness, provisions for the gifted in regular classes, experimental projects.

242 **The Teacher and School Administration** (3)
(Formerly Educ 271)

Role of federal, state, and local administrative units; school finances; legal controls; school plant; public support; improving teaching conditions.

243 **Human Relations in Education** (3)

Principles and practices in human relations between and among learner, teacher, other school personnel, and parents.

245 **School and Community** (3)

The school as an important member of a team of social agencies that builds the community.

247 **Vocational, Technical, and Occupational Education** (3)
(Formerly Adult and Preprofessional Technical and Occupational Education)

Development, current concepts, agencies involved, problems and trends in vocational, technical, and occupational education for adults.

248 **The Teacher and School Supervision** (3)
(Formerly Educ 272)

Nature, organization, human relationships, and techniques of school supervision.

250 **Counseling Drug Abusers** (3)

Counseling theory and practice applied to drug abusers. Crisis interven-

tion, self-help groups, and family therapy; individual and group counseling.

251 **Foundations of Counseling** (3)
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues.

252 **Organization and Administration of Counseling Services** (3)
(Formerly Organization and Administration of Guidance Services)
Principles and procedures for designing and implementing counseling services. Admission by permission of instructor.

253 **Individual Appraisal in Counseling** (3)
Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent.

254 **The Middle School** (3)
Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent.

255–56 **Secondary Education** (3–3)
Examination of historical, psychological, sociological, and philosophical bases; emphasis on prescriptive implications. Special attention to contemporary problems and practices.

257 **Career Development and Information** (3)
Theories of career development; factors influencing the world of work; procedures for evaluating and using socio-personal, educational, and occupational information.

258 **Theories and Techniques of Counseling** (3)
Theories and practices of vocational, educational, and personal counseling. Prerequisite: 12 semester hours in guidance and counseling, including Educ 253 and 257.

259 **Administration of the Elementary and Secondary School** (3)
(Formerly Secondary School Administration)
For experienced teachers and administrators. Survey of administration, including practices of modern schools.

260 **Supervision in the Elementary and Secondary School** (3)
(Formerly Secondary School Supervision)
For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools.

261 **Practicum in Counseling and Human Development** (3)
(Formerly Practicum in Counseling)
Intensive counseling experience under supervision. Emphasis on relationship dynamics, analysis, recommendation, and follow-up. Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258.

263 **Human Resource Development: Training and Education** (3)
Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate pro-

fessional preparation or experience in training, education, and development.

264 **Design of Training Programs in Human Resource Development** (3)
Training, education, and development programs for various client systems will be planned using critical events conceptual model. Field work. Prerequisite: Educ 263 and permission of instructor.

269–70 **School Business Management** (3–3)
Educ 269: philosophy, responsibilities, and functions of the business management office in public education institutions. Educ 270: practicum in educational business management.

275 **Seminar: School Finance** (3)
Educational financial theory, practice, and control, including methods of financing.

276 **Seminar: Public Relations in School Administration** (3)
Purposes, gathering materials, disseminating agencies, publicity media, public participation in policy-making.

278 **School Law** (3)
Sources and scope of school law; legal rights and responsibilities of teachers, pupils, and taxpayers. Other legal problems of major interest to the group.

283 **Higher Education in the United States** (3)
History, scope, purpose, present status, programs and trends in higher education in the United States.

284 **Administration of Higher Education** (3)
Government, organization, and administration of colleges and universities; duties of trustees and administrators.

285 **Student Activities** (3)
Procedures for working with college students on planning, budgeting, and securing policy approval for innovative campus programming.

291 **Planning the School Plant** (3)
Selection of sites; evaluation of existing buildings; utilization of present facilities; adaptation to curricular needs; building, operation, and maintenance problems.

295 **Quantitative Methods II: Research Procedures** (3)
Required of all candidates for master's degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent.

297 **Personnel Administration** (3)
Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions.

299–300 **Thesis Research** (3–3)
Required of M.A. in Ed. degree candidates writing master's theses.

316 **Curriculum Developments in Elementary School Social Studies** (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 **Curriculum Developments in Elementary School Science** (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 **Curriculum Developments in Elementary School Mathematics** (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor.

324 **Teaching Reading and Study Skills at the College Level** (3)

Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: Educ 226, or equivalent and permission of instructor.

325 **Curriculum Theory** (3)

Examination of reviews and research studies in curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation.

343 **Advanced Studies in Human Development** (3)

Review and consideration of classical and empirical research studies on selected topics in human development. Issues, instrumentation, and research needs in respect to each topic discussed. Admission by permission of instructor.

353 **Counseling Older Persons** (3)

Special considerations and counseling emphasis on second careers, retirement adjustments, death and dying.

354 **Cross-Cultural Counseling** (3)

(Formerly Counseling of Minority Groups)

Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States.

355 **Counseling in Groups** (3)

Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling.

357 **Personal and Social Adjustment** (3)

Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents.

358 **Advanced Theories of Counseling** (3)

Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor.

363 **Psychosocial Aspects of Rehabilitation Counseling** (3)

Impact of congenital and later disabilities on attitudes, self-concepts, and motivations. Implications for rehabilitation counseling. Admission by permission of instructor.

370 **College Students and Their Community** (3)

Survey of literature on the characteristics, behavior, and attitudes of the contemporary college student; college students' interaction with the environment. Admission by permission of instructor.

371 **Principles and Practices in College Teaching** (3)

General principles, methods, techniques, and experimental instructional media for teaching at the college and university level.

372 **Internship in College Teaching** (3 to 6)

Supervised experience in a selected area of college teaching. Prerequisite: Educ 371. Admission by permission of instructor.

373 **The Community-Junior College** (3)

The two-year college as it relates to secondary education, four-year colleges, and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges.

374 **Current Issues in Higher Education** (3)

Prerequisite: Educ 283, 284.

375 **Foundations of a College Student Development Program** (3)

College student development as an integral part of higher education programs.

380 **Sensitivity Training: Laboratory Method** (3)

A sensitivity learning experience in human relations using unstructured group experience, individual feedback, experimentation, and practice. Admission by permission of department, prior to registration.

381 **Adult Learning** (3)

Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical, and social environment in adult education situations.

382 **Instructional Strategies in Adult Learning Programs** (3)

Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs.

383 **Interviewing-Counseling for Human Resource Developers** (3)

Applications of interviewing, coaching and counseling skills for the human resource development specialist and others in various occupational settings.

384 **Evaluation of Adult Learning Programs** (3)

Measurement and evaluation of adult learning programs in school and nonschool agencies—business, industry, government, voluntary organizations, and community.

385 **Collective Negotiations in Higher Education** (3)

Theory, practice, problems and issues in collective negotiations in higher education.

386 **Current Issues in Adult Learning Programs** (3)

For M.A. in Ed. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission by permission of instructor.

387 **Administration of Adult Learning Programs** (3)

Program administration, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations.

389 **Consultant-Client Relationship in Human Resource Development** (3)

Examination of the consulting process, consultant-client behaviors, and dilemmas using theory and field experience for individual and organizational development. Prerequisite: Educ 264, 280 *Program Planning in Adult Education (3);* or approval of instructor.

390 **Legal Problems in Higher Education** (3)

Investigation of legal problems in higher education related to administration, students, faculty, and academic program.

391 **College and University Curriculum** (3)

Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum.

392 **Financing Higher Education** (3)

Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices.

393 **Practicum in Higher Education** (3 to 6)

Supervised field experiences in higher education; reports and conferences. Admission by permission of instructor.

394 **College and University Governance** (3)

Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284.

395 **Problems and Practices in Educational Administrative Organization** (3 to 6)

Application of principles and practices concerned with change and evaluation of educational administration.

399 **Seminar: Applied Educational Administration** (3 to 6)

Application of the theories and principles of administration to the public schools. Student participation with guidance by recognized regional practitioners.

Engineering and Applied Science

Associate Director, Joint Institute for Advancement of Flight Sciences, NASA-Langley Graduate Program: S.W. Yuan, Professor of Engineering and Applied Science, Tompkins 311, Telephone 676-6665

Program Advisor of Naval Ship Research and Development Center, Carderock, Md.: J.E. Feir, Professor of Civil Engineering, Tompkins 112, Telephone 676-7179

Program Advisor of Coastal Engineering Research Center, Fort Belvoir, Va.: J.E. Feir, Professor of Civil Engineering, Tompkins 112, Telephone 676-7179

APPLIED SCIENCE

115 Engineering Analysis III (3)

Solution of engineering problems using concepts from probability and statistics, including random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, and regression. This methodology applied to problems of structural design, bioengineering, manufacturing processes, product quality, equipment reliability, engineering management, and societal engineering. Prerequisite: Math 32.

211 Analytical Methods in Engineering I (3)

Engineering applications of the theory of complex variables including contour integration, conformal mapping, integral inversion, and boundary-value problems. Prerequisite: approval of department.

212 Analytical Methods in Engineering II (3)

Analytical methods appropriate to the formulation of engineering problems including finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of department.

213 Analytical Methods in Engineering III (3)

Analytical techniques for solution of boundary-initial problems in engineering involving wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of department.

214 Analytical Methods in Engineering IV (3)

Introduction to variational methods in engineering including Ritz and Galerkin approximation methods for boundary-value problems. Aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of department.

215 Analytical Methods in Engineering V (3)

Advanced methods in solution of boundary-initial value problems in engineering, including characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213.

216 Special Topics in Engineering Analysis (3)

Selected topics such as (1) perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering; (2) application of singular integral equations in problems of mechanics; (3) applications of elements of functional analysis in engineering and science. Prerequisite: approval of department.

CIVIL ENGINEERING

168 Introductory Soil Mechanics (3)

Engineering properties of soils; analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120 *Introduction to the Mechanics of Solids* (3) and ME 126 *Fluid Mechanics* (3).

191 Metal Structures (3)

Principles of the design of metal structures; structural elements; connections; specific problems of analysis; methods of construction. Prerequisite: CE 123 *Structural Theory* (6).

192 **Reinforced Concrete Structures** (3)

Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 123 *Structural Theory* (6).

201 **Design of Metal Structures** (3)

Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent.

202 **Design of Reinforced Concrete Structures** (3)

Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent.

203 **Prestressed Concrete Structures** (3)

Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 202 or equivalent.

206 **Foundation Engineering** (3)

Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of department.

253 **Failure and Reliability Analysis of Engineering Structures** (3)

Operational and structural failure mechanisms; instability, fracture, and fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and reliability, optimal design criteria. Prerequisite: ApSc 115 or equivalent.

254 **Special Topics in Structural Engineering** (3)

Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3) structural design for dynamic loads, (4) structural design for repeated loads, or (5) structural synthesis and optimization. May be repeated for credit. Prerequisite: CE 210 *Methods of Structural Analysis* (3), and approval of department. Topic to be announced in the *Schedule of Classes*.

255 **Coastal Processes** (3)

Longshore currents and nearshore circulation; coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport of sandy dune stabilization, sediment tracing. Prerequisite: approval of department.

258 **Harbor and Coastal Engineering II** (3)

Interaction between structures and waves. Analysis and design of flexible structures: piers, jetties, and protective structures; off-shore drilling platforms. Design criteria, moorings and cables, harbor operations equip-

ment. Prerequisite: CE 252 *General Structural Dynamics* (3); CE 257 *Harbor and Coastal Engineering I* (3) or equivalent.

261 **Analysis of Plates and Shells** (3)

Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status.

263 **Theory of Structural Stability** (3)

General criteria for stability; buckling of elastic and inelastic columns and frames; torsional and lateral buckling; variational methods. Buckling of plates and shells under static loads; stability of stiffened structures; effect of imperfections and boundary conditions. Prerequisite: graduate status.

271 **Theoretical Marine Hydromechanics** (3)

Introductory course designed to acquaint the student with some physical concepts and mathematical tools of theoretical marine hydromechanics. Derivation of the fundamental equations and boundary conditions of a fluid media; application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of department.

274 **Mechanics of Water Waves** (3)

Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state-of-the-art based on correlation between theory and measurements. Wave-breaking and reflexion. Prerequisite: ME 221 or equivalent and permission of instructor.

275 **Special Topics in Ocean Engineering** (3)

Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of department.

COMPUTER SCIENCE

201 **Introduction to Computer Systems I** (3)

Introduction to programming digital computers in a macro-assembly language and higher-level procedural languages; techniques in machine control and memory addressing. Characteristics of different computer structures and the programming of such machines. Introduction to the structure of compiler languages; parsing of compiler language statements. Characteristics and choice of data processing language. Prerequisite: CSci or EE 51 *Applications of Computers* (3) or equivalent, assembly language programming experience, and permission of instructor.

202 **Introduction to Computer Systems II** (3)

Introduction to combinational and sequential logic networks; analysis and synthesis of switching circuits using Boolean algebra; minimization tech-

niques in the design of logical circuits; number systems and arithmetic in digital computers, digital computer architecture and the design of functional sub-units; design of memory, arithmetic, and units comprising a digital computer; information flow, timing, and control in large digital computers. Prerequisite: CSci 201 or permission of instructor.

214 **Data Structures** (3)

Computer data structures; arrays, items, pointers, lists, insertion and deletion, available space management, threaded lists, two-way lists, garbage collection and compactification. Push-down stacks, strings and files. Tree structures and searching; hash table searches, bubble, radix, and merge sorting. Sequential, index-sequential and random files; access methods; sorting of files. Subroutines, co-routines, macros, flags, relocation, and recursion. Buffer pools and buffer management, data management, and storage. List and string processing languages. Prerequisite: CSci 158 *Algorithmic Methods and High-level Languages* (3) or 201; 213 *Computer-aided Analysis and Design of Networks* (3).

219 **Interactive Computer Graphics** (3)

Display devices, CRT, point plotting and vector generation, character generators; display files, data structures, linear and area transformations, clipping and windows; graphic input devices; interrupt handling; scaling; perspective, projection, hidden line elimination; command languages, time-shared interactive graphics, software support. Prerequisite: CSci or EE 159 *Programming and Data Structures* (3), or CSci 214; or permission of instructor.

237 **Computing Systems** (3)

Organization of large digital computer systems. Design of high-speed arithmetic units. Random access and associative memories; rotational storage devices; computer control and interrupt structures. Input-output channels and interfacing problems. Communications in digital computers. Introduction to multiple access and time-sharing systems. Prerequisite: CSci or EE 154 *Ditigal Computer Design* (3) or CSci 202.

255 **Formal Languages, Correctness, and Structured Programming** (3)

Introduction to formal computer languages. Structured programming and block-oriented languages. Regular, context-free, context-sensitive, and unrestricted computer grammars. Parsing a language, syntax of languages, pushdown automata and their use in compiling. Top-down structured programming. Avoidance of GO TO statements. Correctness, termination, and equivalence of programs. The inductive assertion method. Termination methods based on well-ordered sets. Assertion languages, program schemes, fixed point methods, and inductive principles. Prerequisite: CSci 214.

263 **Digital Computer Programming Systems** (3)

Design of computer systems software. Use of a macro-assembler and job control language. Design of assemblers and loaders. Concepts of multiprogrammed job control including linking, loading, linkage-edit, relocatability, and status switching. Design of dispatchers and monitors. Communications between components of an operating system. Input-output programming and control. Design of utility programs. Prerequisite: CSci 214 *Data Structures* (3) or permission of instructor.

ELECTRICAL ENGINEERING

152 **Introduction to Digital Computers** (3)

Introduction to the use of structure of minicomputers and larger computers. Boolean algebra and the design of combinational switching circuits. Number systems, codes, and arithmetic operations in digital computers. Digital computer subsystems and their interconnections. Interfacing equipment to a minicomputer; timing, control, and electronic requirements. Introduction to programming analog computers; analog computer components; analog-to-digital conversion. Prerequisite: EE 157 *Machine and Assembly Language Programming* (3).

153 **Design of Switching Systems** (3)

Switching algebra and Boolean logic; sets, relations, and lattices. Analysis and design of switching devices; design of combinational logic networks. Minimization techniques and decomposition methods. Electronic implementation of logic; contact networks, symmetric functions, and threshold logic. Reliable design and fault-detection tests. Number systems and codes, geometric interpretation, error detecting and correcting codes; encoders and decoders. Logic and electronic design of functional digital units. Sequential circuits and iterative networks. Minimization and transformation of sequential machines; structure of sequential machines; partitions and covers. State identification and fault-detection experiments. Prerequisite: EE 152 or permission of instructor. May be taken for graduate credit.

201 **Natural Modes and Transients in Electrical Systems** (3)

Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; sampling.

202 **Linear System Theory I** (3)

Graph theory and its application to networks and systems; system description in time and frequency domain; linear spaces and linear operators; mathematical representation of linear systems; analytical and computer solutions of the state equations; transient and steady-state response. Prerequisite: graduate status.

203 **Linear System Theory II** (3)

System properties; controllability and observability of linear systems; sensitivity and stability analyses. Irreducible realizations of rational transfer-function matrices; canonical forms, state feedback, and state estimators. Linear composite systems. Prerequisite: EE 202.

204 **Stochastic Signals and Noise** (3)

Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science.

224 **Quantum Electronics of Masers and Lasers** (3)

Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms; rate equations. Resonators, He-Ne laser; organic dye lasers; injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 *Physical Electronics II* (3) or equivalent.

241 **Information Theory** (3)

Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem; bounds on the performance of communication system; the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204.

242 **Coding Theory** (3)

Error-correcting codes; bounds on the performances of error-correcting codes, group codes; syndrome decoding; cylic codes, their encoding and decoding; Galois fields; BCH codes, burst correction, and threshold-decodeable codes; performance calculations. Prerequisite: EE 204.

243 **Communication Theory I** (3)

Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent.

244 **Communication Theory II** (3)

Schemes for efficient signaling for data sequences; effects of quantizing at the receiver; detection of such signals in colored noise; detection of stochastic signals; the innovations approach in detection and estimation problems; signaling over fading channels and the optimum receivers; diversity techniques and their performances. Prerequisite: EE 243.

245 **Signal Detection and Estimation Theory** (3)

Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244; or equivalent.

*250 **Telecommunication Systems Concepts** (3)

Essential elements of an electrical communication system, speech, TV, and data signals, spectrum, bandwidth, sampling. Amplitude, frequency and pulse code modulation and comparative performance. Multiplexing schemes, communication quality standards and objectives. Signal power, noise power, distortion, and channel capacity. Probability, traffic theory, reliability, voice, TV, and data transmission. Telecommunication, microwave radio, cable, and satellite communications systems.

*251 **Survey of Telecommunication Systems** (3)

Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major design considerations. Overall system design of microwave radio system. Radiowave propagation fundamentals. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design consideration and values of significant parameters for a typical satellite communications link. Overall design of a cable communication system. Digital transmission and digital terminals. Wideband data transmission. Frequency allocation.

* EE 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

298 **Research** (arr.)
Research as arranged. May be repeated for credit.

299–300 **Thesis Research** (3–3)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit.

ENGINEERING ADMINISTRATION

150 **Introduction to Engineering Administration** (3)
The interrelationships of engineering, science, and management; conceptual foundations for interaction of human factors in individuals, groups, and the social environment of engineering activities. Familiarization with typical activities of engineering managers, and with factors bearing on the motivation of engineers and on engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to the complete management process studied in EAd 211–12.

160 **Introduction to Engineering Economic Analysis** (3)
Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit/cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before and after tax analysis.

170 **Basic Quantitative Methods for Engineering Administration** (3)
An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability, statistics, and operations research.

204 **Administration of Engineering Contracts** (3)
Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and administration of the contract to completion considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services.

207 **The Personnel Function for Engineering Administrators** (3)
Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment.

210 **Engineering Law** (3)
Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research and developmental contracts.

211–12 **Engineering Administration** (3–3)
Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and com-

mittees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Students who receive credit for EAd 201 *Management for Scientists and Engineers* (3). Prerequisite: EAd 150, EAd 160, or equivalent.

221–22 **Environmental Management** (3–3)

The spectrum of technical, economic, political, administrative, and social forces influencing the quality of our environment. Review of governmental and industrial programs to combat pollution of the air and water, and to control pesticides, noise, and radiation. Historical development of legislation dealing with environmental science and management. Review pending legislation involving environmental and energy matters; theoretical aspects of specific management problems.

231 **Program Management** (3)

Programs and projects are widely used in industry and government to facilitate the management of technical undertakings. Management science, the systems approach, and traditional managerial concepts are applied to a variety of typical cases.

241 **Construction Management I** (3)

Contract negotiations; aspects of contracts and specifications important to management. Construction estimating and cost allocation in heavy and building construction; budgeting and accounting concepts.

242 **Construction Management II** (3)

Construction administration: organization, construction planning, and scheduling. Industrial relations and human factors in construction management, work measurement, programming and progressing, project management and control.

255 **Administration of Research and Development** (3)

The study of technological innovation as a vital part of the acquisition process; the role of the technical administrator in utilizing organization, plans, and control to accomplish research and development objectives.

261 **Economic Analysis in Engineering Planning** (3)

Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or equivalent.

269 **Elements of Decision-Making and Problem-Solving** (3)

Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and other subjective factors. Managerial economics. Engineering economy, model building, testing, solving. Replacement under certainty, risk. Control-general, control charts, sampling inspection. Experimentation to differentiate variables, build models-canons of induction, statistical tests, analysis of variance, linear regression. Application to nonmathematical formulations.

281 **Systems Analysis and Management I**

282 **Systems Analysis and Management II**

297 **Problems in Engineering Administration**

ENGINEERING SCIENCE

203–4 Probability and Statistics of Metrology (3–3)

Probability distributions, discrete and continuous distributions; sampling; combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin Square experiments; factorial experiments; block and lattice design. Prerequisite: ApSc 115 or equivalent.

221 Theory of Elasticity I (3)

Introduction to Cartesian tensor analysis; deformation, stress, linear constitutive relations, formulation of boundary value problems, variational principles; torsion and bending of prismatical rods, plane problems in elastostatics. Prerequisite: approval of department.

229 Transformations in Materials (3)

Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: approval of department.

231 Structure of Materials (3)

Space lattices, crystal structures, planes, directions, anisotropy, texture and preferred orientations, stereographic projections, Bragg's law, Laue techniques, moving crystal diffraction, Debye-Scherrer method, x-ray spectrometry, electron microscopy, bonding energy of crystals, lattice energy, lattice vibrations, free electron theory, zone theory, alloy theories, conductors, insulators and semiconductors, magnetism, resistivity, defects in metals. Prerequisite: approval of department.

234 Composite Materials (3)

Principles of composites and composite reinforcement; micromechanics and failure; interface reactions in various composites; reinforcing materials; structure of composites—fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of department.

239 Physical Ceramics (3)

Crystal chemistry and the systematic study of the structure of ceramic materials; solid reactions occurring at elevated temperatures; sintering vitrification, diffusional mechanisms and effects; reaction rate theory; elastic, anelastic, and plastic properties of ionic and covalent solids; viscoelastic behavior of vitreous and vitreous-solid systems; phase equilibria of ceramic systems. Prerequisite: approval of department.

240 Fracture Mechanics (3)

Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture toughness, engineering analysis, notch strength analysis with limit approach, crack propagation laws, fatigue, fracture testing, comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261.

263 Atmospheric Physics for Engineers I (3)

Atmospheric radiation: phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of department.

270 Theoretical Acoustics I (3)
(Formerly Introduction to Acoustics)
Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ME 221, ApSc 213 or equivalent.

271 Random Process Theory I (3)
Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of department.

272 Random Process Theory II (3)
Discrete and continuous state Markov-processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in communication theory; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 271.

273 Time Series Analysis (3)
Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; periodogram, Blackman-Tukey and direct filtering methods of spectral estimation; effects of finite length and digitization; variability; coherence. Fast Fourier transform techniques; applications in modern technology. Prerequisite: EngS 271 or approval of department.

274 Noise and Vibration Control (3)
Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise; automobile and truck noise; factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215.

275 Theoretical Acoustics II (3)
(Formerly Advanced Theoretical Acoustics)
General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270.

276 Acoustical and Mechanical Measurements (3)
Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215.

277 Physical Acoustics (3)
Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275.

278 **Psychological and Physiological Acoustics** (3)

Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of department.

279 **Human Factors in Engineering** (3)

Man-machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress.

280 **Special Topics in Acoustics** (3)

Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of department.

284 **Numerical Methods in Engineering** (3)

The uses of computers in engineering and science; numerical interpolation, integration and differentiation; least squares approximations and application to data fitting; roots of polynomials; eigenvalue and eigenvector problems; solution of systems of linear equations; ordinary differential equations; introduction to solution of partial differential equations; applications to initial and two-point boundary value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of department.

285 **Finite Element Methods in Engineering Mechanics** (3)

Formulation of the finite element method through the use of variational principles for structural and continuum mechanics problems. Plane stress, plane strain, three-dimensional elasticity, plate bending, thermal conduction, and potential flow. Techniques of constructing and assembling characteristic elemental matrices, computer implementation of the finite element method. Prerequisite: approval of department.

286 **Analysis and Design of Thin-walled Structures** (3)

Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures; strength and stiffness of locally buckled stiffened structures; classification of loads and safety factors; different considerations governing the design of thin-walled structures; critical evaluation of various structural design procedures. Prerequisite: approval of department.

287 **Automated Design of Complex Structures** (3)

Review of techniques for automated design including mathematical programming, fully stressed design, and optimality criteria; application of automated design techniques to stiffened and composite shell-type structures; multiple-load conditions and design constraints. Prerequisite: approval of department.

289 **Special Topics in Theoretical and Applied Mechanics** (3)

Prerequisite: approval of department.

298 **Research** (arr.)

Basic research projects as arranged. May be repeated for credit.

299–300 **Thesis Research** (3–3)

310 Aeroacoustics (3)

General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275.

311 Nonlinear Acoustics (3)

Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of department.

312 Theory of Random Vibration (3)

Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215.

313 Structural Acoustic Interaction (3)

Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312.

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit.

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit.

MECHANICAL ENGINEERING

215 Theory of Vibrations (3)

Damped and undamped natural vibrations, transient response and response to harmonic and periodic excitation, natural vibration of discrete and continuous systems; integral formulation of eigenvalue problems, response by modal analysis, approximate methods, influence of secondary effects and constraints, damped systems. Prerequisite: approval of department.

216 Structural Dynamics (3)

Methods of solving vibration problems: differential equation, Rayleigh-Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: ME 215.

221 Intermediate Fluid Mechanics (3)

The continuum, kinematics of fluids; stress tensor, strain and rate-of-strain tensor; fundamental equations of the flow of viscous compressible fluids; Laplace's equations; source, sink, and doublet; vortices, Biot-Savart theorem and the flow field of a vortex; spherical and cylindrical harmonics; methods of singularity distributions, complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of department.

222 Applied Fluid Dynamics (3)

Subsonic lifting line wing theory, direct and inverse solution of the lifting surface theory; singularity method for wing-body combination; vortex lift theory; effects of camber and twist distribution; transonic airfoils, effect of wing sweep, area ruling concept; supersonic linearized wing theory; similarity rules. Prerequisite: ME 221 or equivalent.

227 Viscous Flow (3)

Exact solution of Navier-Stokes equations; the small Reynolds number approximations, laminar boundary-layer theory and the techniques for its solution, stability of laminar flows; Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory; applications to heat-transfer problems; flow separation. Prerequisite: ApSc 213; ME 221 or equivalent.

235 Compressible Flow (3)

Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock wave interactions, holograph transformation, Kármán Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; ME 221 or equivalent.

237 Propulsion (3)

Basic concepts of propulsion: energy transformations in propulsive flows; gas dynamics of combustion, detonation processes; nonuniform flows, mixing; intakes, additive drag: mechanics of flow induction; drag and thrust generation; multiple-flow thrust generators; thrust recovery and augmentation; the propulsion spectrum. Illustrative examples will include propellers, turbojets, turbofans, ramjets, and rockets. Prerequisite: approval of department.

248 Seminar: Aircraft Design I (3)

Problem of designing an aircraft to specifications. Regulatory restraints and requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of department.

270 Aerodynamics of Flight Vehicles (3)

Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: ME 222 or equivalent.

271 VTOL Aircraft Technology (3)

Fundamental principles of VTOL aircraft; hovering performance based on momentum theory; analysis of jet-induced interference effects; transition aerodynamics; theoretical stability and control and correlation with flight data; ground-effect theory and experiment; handling qualities criteria; elements of instrument approach and landing problem. Prerequisite: approval of department.

273 Principles of Automatic Flight Control (3)

Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback con-

trol, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of department.

274 **Principles of Flight Guidance** (3)

Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273.

275 **Stability and Control of Vehicles** (3)

Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques and frequency response analysis. Prerequisite: approval of Department.

276 **Mechanics of Space Flight** (3)

First- and second-order Hamilton-Jacobi perturbation theory applied to artificial satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison of various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of department.

279 **Special Topics in Flight Sciences** (3)

Current problems and methods in high angle of attack stability and control. Nonlinear aerodynamics in the angle of attack region above the stall. Influence of aircraft design and nonlinear aerodynamic parameters on the poststall stability and control of aircraft. Employment of current experimental techniques and development of equations pertaining to developed spin and recovery characteristics. Prerequisite: ME 275 or approval of department.

280 **Advanced Thermodynamics** (3)

Statistical significance of the entropy concept, conditions of equilibrium, equilibrium of heterogeneous systems. Application of thermodynamic formalism to magnetic, electric, and solid systems; equilibrium of ionized gases; the Nernst postulate and the third law of thermodynamics. Prerequisite: graduate status.

281 **Nonequilibrium Thermodynamics** (3)

Limitations of equilibrium thermodynamics, entropy production, phenomenological equations and linear laws; postulates of nonequilibrium thermodynamics, formulation of the equations of nonequilibrium systems, statistical foundations, stationary nonequilibrium states; selected applications. Prerequisite: ME 280.

290 **Kinetic Theory of Gases** (3)

Equation of state and physical properties for gas composed of discrete particles; relation of kinetic theory to thermodynamics; Maxwell distribution of molecular velocities; Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280.

297 **Special Topics in Fluid Mechanics** (3)

Prerequisite: approval of department.

298 **Research** (arr.)
Research as arranged. May be repeated for credit.

299–300 **Thesis Research** (3–3)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit.

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit.

English

Chairman: J.P. Reesing, Jr., Professor of English; Stuart 407, Telephone 676-6180

Before students are registered in Engl 10, they are tested in the minimum essentials of vocabulary, spelling, grammar, standard usage, and writing skill. Those students who show marked superiority may, upon passing further tests, be exempted from one or both halves of the English Composition course; those who are inadequately prepared for Engl 10 will be given permission to register for Engl 9 on campus. Engl 9 or 10 is prerequisite to all other courses in English.

ENGLISH AS A FOREIGN LANGUAGE

1 **English for International Students** (0)
Elementary grammar, reading, vocabulary, and conversation. Course meets 10 class hours and five monitored laboratory hours per week. Further laboratory work encouraged.

2 **English for International Students** (0)
Lower intermediate grammar, reading, vocabulary, and conversation. Course meets 10 class hours and three monitored laboratory hours per week. Further laboratory work encouraged.

3 **English for International Students** (3)
Intermediate grammar, reading, vocabulary, and conversation. Course meets 10 class hours and three monitored laboratory hours per week. Further laboratory work encouraged.

4 **English for International Students** (3)
Higher intermediate grammar, reading, vocabulary review, and conversation; for international students not yet ready for extended training in composition. Course meets 10 class hours and three monitored laboratory hours per week. Further laboratory work encouraged.

5 **English Composition for International Students** (3)
Extended writing practice for international students showing high degree of proficiency in use of English. Development of writing skills; study of expository techniques and library research methods. Course meets four hours per week. Students completing Engl 5 with a grade of *A* or *B* will receive academic credit for the course and may enroll in Engl 11 or 12 to fulfill the Columbian College undergraduate requirement in English.

7 English Composition for International Students (3)

A more advanced composition course, following English 5, for undergraduates not yet ready to take Engl 11 or 12 and for graduate students in need of further writing practice. The course requires weekly reading and writing assignments and a research paper. Students are expected to be familiar with expository techniques and library research methods taught in Engl 5. The course meets four hours per week.

NGLISH COMPOSITION

9 English Composition: Language as Communication (3)
(Campus Course)

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. In addition, a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semesters hours of credit; the reading course meets an additional three hours a week for a maximum of 10 weeks. Fees: tuition, $315; special fee, $25.

10 English Composition: Language as Communication (3)

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure.

11 English Composition: Language and the Arts and Sciences (3)

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10.

20 The Writing of Reports (3)

Theory and practice in the writing of technical reports. Prerequisite: Engl 9 or 10 and 11.

UMANITIES

43–44 Classical Humanities (3–3)

Interdisciplinary study of the origins of Western thought. Reading and intensive class discussions of selections from the Bible and of five works each semester from the following authors: Homer, Hesiod, Aristophanes, Plato, Aristotle, Aeschylus, Euripides, Sophocles, Herodotus, Thucydides, Lucretius, Marcus Aurelius, Epictetus, Polybius, St. Augustine. Background lectures on the major intellectual, artistic, economic, and social movements.

45–46 Humanities in the Modern World (3–3)

Interdisciplinary study of modern Western thought from the Renaissance to the 20th century. Reading and intensive class discussion of five works each semester from the following authors: Machiavelli, Pope, Voltaire, Rousseau, Goethe, Tolstoy, J.S. Mill, Zola, Nietzsche, Kierkegaard, Freud, Kafka, Koestler, T.S. Eliot. Background lectures on the major intellectual, artistic, economic, and social movements.

ENGLISH LITERATURE

51–52 Introduction to English Literature (3–3)

Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature.

AMERICAN LITERATURE

71–72 Introduction to American Literature (3–3)

Historical survey. Engl 71: From beginnings to the Civil War. Engl 72: From the Civil War to present.

175 Special Topics in American Literature (3)

Biography as literature.

Environmental Health*

For further information call David A. Rowley, Assistant Dean, Graduate School of Arts and Sciences, Telephone 676-6210

201 Introduction to Epidemiology and Environmental Health (3)

Open to qualified graduate students. Principles and methodology of epidemiology and biostatistics. Ecological approach to health and disease, including parasitology and mycology.

231 Venereal Disease in the Community (3)

A survey course to develop an understanding of venereal disease problems. Etiology, clinical manifestations, diagnosis, prevention, and control. For parents, school teachers, health personnel, and other educators.

240 Environmental Impact Statement Procedures and Environmental Law (3)

The rationale for environmental impact statements from the viewpoint of the nature and origins of the environmental crisis. Government agencies responsible for environmental impact statements, current statutes and regulations pertaining to the environment.

254 Human Ecology (3)

Ecology—man within the framework of reference—physical and cultural anthropology, geography, sociology, urban planning, public health, and public administration.

256 Introduction to Environmental Health (3)

Organizations, functions, current practices, and regulations at all levels to control the environment. Economic impact upon society and industry in carrying out control and preventive practices.

270 Industrial Hygiene (3)

Industrial health hazards: chemical exposure to toxic dusts, metallic

* These courses are included in certain interdepartmental programs of the Master of Arts/Master of Science in Special Studies degree which is under the academic jurisdiction of the Graduate School of Arts and Sciences.

fumes and vapors, gases, and organic compounds; physical hazards such as high and low temperature biological effects, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and particulate pollution; prevention and control of industrial health hazards.

293 **Public Health and School Health Methods and Activities** (3)

Relationship between public health and school health. The purpose of the course is to aid the teacher in presenting information in the classroom setting.

301 **Applied Epidemiology and Environmental Health** (3)

Lectures, seminars, and case studies. Epidemiological solutions to health problems of the community.

Forensic Sciences

Chairman: C.E. O'Rear, Professor of Forensic Sciences, Samson Hall, Telephone 676-7397 or 676-7398

201 **Forensic Serology** (3)

Fundamental analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology—from presumptive tests to blood enzyme classifications. Laboratory exercises.

202 **Instrumental Analysis** (3)

Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophometric techniques and mass spectrometry. Laboratory exercises.

203 **Examination of Questioned Documents** (3)

Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory exercises.

204 **Firearms and Tool-mark Identification** (3)

Methods for identifying firearms, cartridge casings, tool-marks, tire marks, and footprints. Laboratory exercises.

214 **Forensic Psychiatry** (3)

Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

220 **Introduction to Forensic Science** (3)

(Formerly The Crime Lab, the Forensic Scientist, and the Criminal Lawyer)

Survey of the forensic physical sciences; qualifications and preparation of expert witnesses and their court roles in criminal and civil cases; operation and functioning of the forensic laboratory.

224 Introduction to Criminal Law (3)

(Formerly Introduction to Criminal Law, Procedure, Evidence, and Legal Methods)

Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.

225 Advanced Criminal Evidence (3)

Procedural rules affecting the collection and use of physical evidence. Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224.

227 Advanced Criminal Procedure (3)

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Prerequisite: ForS 224.

228 Administration of Criminal Justice (3)

Consideration and analysis of selected advanced problems in the administration of criminal justice. Emphasis on the role and professional responsibilities of prosecutor and defense counsel and on developmental trends in the law. Prerequisite: ForS 224.

251 Moot Court (3)

Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes.

254 Selected Topics in the Forensic Sciences (3)

Current issues in research, investigation, and law.

260 Introduction to Forensic Medicine (3)

(Formerly Introduction to Human Physiology and Pathology)

Anatomy and physiology of the human body with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart relating to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 Introduction to Forensic Pathology (3)

Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 The Illicit Use of Drugs (3)

Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. in Sp.Std. degree candidates; open to others with permission of instructor.

266 Seminar: Modern Trends in Criminal Justice (3)

Recent advances in criminal justice. Discussions incorporate several disciplines including science, law, management, social sciences, and psychology.

269 **Forensic Toxicology** (3)

Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology.

295 **Research** (arr.)

Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member. Laboratory exercises in those methods in principal use in crime laboratories.

299–300 **Thesis Research** (3–3)

French*

Chairman: G.E. Mazzeo, Professor of Romance Languages; Monroe 429, Telephone 676-6330

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 **First-year French** (3–3) (Campus Course)

A year course: credit toward a degree at this University given on completion of Fren 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 a semester.

3–4 **Second-year French** (3–3) (Campus Course)

A year course: credit toward a degree at this University given on completion of Fren 4. Conversation, grammar, composition, reading in modern French prose. Oral practice in language laboratory. Prerequisite: Fren 1–2 or two years of high school French. Laboratory fee, $17.50 a semester.

Geodesy†

Program Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography, Telephone 676-7000 or 946-3557

12 **Plane Surveying** (3)

Basic plane surveying for cartographers and surveyors. Field exercises as arranged. Prerequisite: Math 30 or equivalent mathematical experience.

13 **Higher Surveying** (3)

(Formerly Geodetic Surveying)

Elements of geodetic and hydrographic surveying for cartographers and

* Administered by the Department of Romance Languages and Literatures.
† Affiliated with the Department of Geography and Regional Science.

surveyors. Field exercises as arranged. Prerequisite: Geod 12 or permission of instructor.

17 Elementary Photogrammetry (3)

Fundamentals of aerial photography, photogrammetric optics, and photographic processes; mathematics of vertical and tilted photographs; stereoscopy and parallax; planning and executing the photogrammetric project; radial triangulation methods; photomaps; oblique and terrestrial photography. Recommended prerequisites: Geod 12, Math 30.

18 Intermediate Photogrammetry (3)

Basic theory and practices. Stereoscopic plotting instruments; graphical and computational methods for adjusting strips of aerotriangulation. Method of least squares, statistics and transformations applied to photogrammetry. Prerequisite: Geod 17.

110 Map Projections (3)

Elementary theory of projections in cartography and geodesy. Projection of the sphere and ellipsoid on plane, conical and cylindrical surfaces. Prerequisite: Math 32.

117 Analytic Photogrammetry (3)

(Formerly Advanced Photogrammetry)

Analytic photogrammetry theory and practice: matrix algebra, method of least squares, image coordinate refinement, formulation for analytic photogrammetry, intersection, linearization of equations, space resection, two- and three-photo relative orientation, strip adjustment review, block adjustment. Prerequisites: Math 32, Geod 18.

119 Advanced Mathematical Photogrammetry (3)

Mathematical treatment of resection, intersection, relative orientation, error propagation, adjustment and coordinate transformation using matrix algebra. Derivation of colinearity equations and image coordinate corrections for frame, panoramic and strip photography. Prerequisites: Geod 17, Math 124 or equivalent experience.

150 Geometric Geodesy (3)

(Formerly 155 Elementary Geodesy)

Principles and formulas basic to theoretical and applied geodesy. Primary emphasis on geometric methods. Prerequisite: Math 32 or permission of instructor.

151 Physical Geodesy (3)

(Formerly 155 Elementary Geodesy)

Physical and celestial methods and application of geodesy. Prerequisites: Phys 1 or 3, Math 32; or permission of instructor.

156 Geodetic Astronomy (3)

Astronomic determination of longitude, time, azimuth, and latitude. Prerequisite: Math 32, Geod 155 or comparable experience.

158 Electronic Surveying and Navigation (3)

An examination of the principles and applications of techniques. Topics include: EM wave propagation, system error identification and analysis, representative surveying systems, baseline radio navigation systems and long line calculations and transformation techniques. Prerequisite: Math 32, Phys I, Cart I or Ocea 11; or permission of instructor.

160 Adjustment Computations I (3)

Basic adjustment theory. Prerequisites: Geod 150, Math 32, 124 (or equivalent experience), Stat 107 or permission of instructor.

161 Adjustment Computations II (3)

Topics in advanced adjustment theory. Applications to geodesy and photogrammetry. Prerequisite: Geod 160.

165–66 Space Techniques for Geodesy (3–3)

Determination of the gravitational field, station positions and fundamental physical constants. Basic celestial mechanics, computing techniques and data analysis. Modern data acquisition systems. Prerequisites: Math 33, 124, Geod 150, 151; or equivalent experience.

Geography and Regional Science

Chairman: M. Gordon, Professor of Geography and Regional Science; I-200, Telephone 676-6185

51 Introduction to Geography (3)

General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts.

52 Introduction to Economic Geography (3)

Examination of the basic principles which determine the location of economic activities.

127 Population and Settlement (3)

Patterns of world population; factors contributing to population pressures, growth, and migrations.

132 Resource Management and Conservation (3)

Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies.

133 Geography of Poverty and Hunger (3)

Consideration of the locational aspects and correlates of poverty and hunger; rural and urban poverty regions; regional food budgets and taboos; programs concerned with the elimination of poverty and hunger.

141 Urban Settlement (3)

Distribution of urbanization on the surface of the earth; processes which lead to urbanization; theories which can be used to analyze the location of cities.

145 Cultural Geography (3)

Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations.

146 Political Geography (3)

Analysis of the interrelationships between the political community and the human and physical environment.

148 **Principles of Geography** (3)
Study of geographic principles, technology and tools designed to meet specific needs of teachers. Emphasis on the practical application of geographic concepts and the use of source materials in the classroom.

155 **Africa** (3)
Survey of the cultural and physical regional patterns of Africa.

161 **Latin America** (3)
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America.

164 **Geography of China** (3)
Survey of the cultural and physical regional patterns of China.

208 **New Perspectives in Geography** (3)
An overview of recent trends in geographic research. Selected topics include diffusion processes, spatial behavior, locational analysis, and environmental perception.

224 **Seminar: Political Geography** (3)
Examination of the political factor in location theory and analysis of the nature of political territories.

243 **Seminar: Urban Geography** (3)
Functional processes affecting the evolving morphology and internal spatial patterns of urban phenomena; emphasis on economic factors, behavioral considerations, and impact of time.

Geology

Chairman: F.R. Siegel, Professor of Geochemistry; Bell 3, Telephone 676-6190

1–2 **Introductory Geology for Nonscience Majors** (3–3) (Campus Course)
Lecture (2 hours), laboratory (2 hours). Survey covering the principles of geology; emphasis on man's effect on the environment. Laboratory fee, $15 a semester.

3 **Introductory Geology for Nonscience Majors** (3)
Nonlaboratory course for off-campus students only. Survey covering the principles of geology.

4 **Introductory Geology for Nonscience Majors** (3)
Geological periods, evolution of life on earth. Nonlaboratory course for off-campus students only. Prerequisite: Geol 1 or 3, or permission of instructor.

5 **Environmental Geology** (3) (Campus Course)
The relation of people and society to natural environment; population evolution and mineral resources; economic, legal, and political aspects. Laboratory fee, $15.

14 **Mineralogy and Petrology for Nonscience Majors** (3) (Campus Course)

Lecture (2 hours), laboratory (2 hours), field trips. Prerequisite: Geol 1 or permission of instructor.

125 **Marine Geology** (3) (Campus Course)

Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1–2 or 21–22; or permission of instructor.

141 **Introductory Geochemistry** (3) (Campus Course)

Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisite or concurrent registration: Geol 117 or equivalent; Chem 11–12; Math 30; Phys 1 or 3; or permission of instructor. Laboratory fee, $5.

Germanic Languages and Literatures

Chairman: C. Steiner, Associate Professor of German; Rice 404, Telephone 676-6195

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 **First-year German** (3–3) (Campus Course)

Fundamental concepts of German culture; essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural-oral practice in language laboratory. Prerequisite to Germ 2: Germ 1. Laboratory fee, $17.50 a semester.

3–4 **Second-year German** (3–3) (Campus Course)

Introduction to German civilization, selections from modern German prose, continuation and review of German structure, conversation and simple composition. Aural-oral practice in language laboratory. Prerequisite to Germ 3: Germ 1–2 or equivalent. Prerequisite to Germ 4: Germ 3. Laboratory fee, $17.50 a semester.

Health Care Administration

Chairman: L. Gintzig, Professor of Hospital Administration; Binney 21, Telephone 676-6220

153 **Survey of Health Care Organization** (3)

Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system.

154 **Introduction to Hospital Management and Procedures** (3)

Introduction to the structure and management of contemporary American

hospitals; emphasis on the organization of hospital departments and on the functions of the department manager.

202 **Introduction to Health Care Systems** (3)

Lecture and discussion (2 hours), laboratory (2 hours). Introductory description and analysis of the American health and medical care systems. Organization, characteristics, and relationships of research, technology, manpower, public and private delivery, and financing mechanisms. Survey of major disease problems and their impact on administration and planning. Medical terminology.

203 **Organization and Management of Health Care Institutions** (3)

Lecture and discussion (2 hours), laboratory (2 hours). History and current character of institutional providers of health care. Function, organizational structure, and interrelationships of various types of health care facilities. Institutional ethics; statistics. Regulation of institutional providers.

205 **Hospital Administrative Practices** (3)

Lecture and discussion (2 hours), laboratory (2 hours). Organization, management and interrelationships of hospital, clinical, support, and administrative departments. Analyses of procedures and systems. Hospital personnel administration. Administrative ethics. Requirements of the Joint Commission on Accreditation of Hospitals. Prerequisite: HCA 203.

209 **Health Resources Management** (3)

Lecture (2 hours), laboratory (2 hours). Introduction to resource analysis, financial management, and health economics/statistics of health care institutions. Estimates of health services demand and resource requirements. Preparation of budgets, financial statements and reports. Financial analysis. Public and private health insurance. Management of medical facilities and material. Regulation and containment of costs. Safeguarding hospital assets.

Hebrew*

Chairman: J.E. Ziolkowski, Associate Professor of Classics; T-23, Telephone 676-6125

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

21–22 **Beginning Hebrew** (3–3) (Campus Course)

Grammatical essentials of the language; readings selected from classical and modern texts; basic audio-lingual drills for comprehension and expression. Laboratory fee, $17.50 per semester.

23–24 **Intermediate Hebrew** (3–3) (Campus Course)

Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals

* Administered by the Department of Classics.

to liturgical poetry and rabbinic narratives. Laboratory fee, $17.50 per semester.

History

Chairman: R.W. Kenny, Professor of History; Stuart 419, Telephone 676-6230

Departmental Prerequisite: Students are expected to bring to second-group courses an appropriate level of background preparation. Ordinarily, this is achieved by successful completion of first-group courses in the same area or by presenting evidence of equivalent preparation. Students lacking such preparation may take second-group courses only with the consent of the instructor. Students may waive one or more of the prerequisite courses by passing a departmental waiver examination, by attaining scores of 600 or above on the College Entrance Examination Board Achievement tests, or by good performance on Advanced Placement Examinations.

39–40 **European Civilization in Its World Context** (3–3)

Hist 39: political, social, economic, and cultural history to early modern era. Hist 40: from early modern era to present.

71–72 **Introduction to American History** (3–3)

Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present.

131-32 **History of Germany** (3–3)

Political, social, and cultural development. Hist 131: from mid-17th century to Bismarck. Hist 132: from William II to present.

138 **History of World Communism** (3)

The international communist movement from its beginning to the present.

145 **Imperial Russia** (3)

From the reign of Peter the Great to World War I.

146 **Soviet Russia** (3)

The Russian Revolution and Soviet rule to the present.

149–50 **European Diplomatic History** (3–3)

Emphasis on policies and actions of the great powers and their statesmen. Hist 149: 1812 to 1890. Hist 150: since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157 *20th-century European Diplomatic History*.

163–64 **History of Latin America** (3–3)

Political, socioeconomic, and cultural development. Hist 163: colonial period. Hist 164: national period.

181–82 **U.S. Diplomatic History** (3–3)

American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century.

195–96 **History of East Asia** (3–3)

Civilizations of China and Japan; emphasis on institutional development.

Hist 195: beginnings to about 1800. Hist 196: from eve of the modern era to present.

201 **History and Historians** (3)

Readings and discussion on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199 *Proseminar: Readings for the History Major.*

Human Kinetics and Leisure Studies

Chairman: J.L. Breen, Professor of Human Kinetics and Leisure Studies; K–20, Telephone 676-6280

101 **Physical Education and Sports in Human Resource Centers** (3)
(Formerly Physical Education in the Elementary School)

Development of physical education and sports programs in schools and play settings. Includes philosophy and curriculum.

105 **Introduction to Adaptive Physical Education and Therapeutic Recreation** (3)

Philosophy, methods, and concepts relating to recreation and adaptive physical education for the ill, aged, and disabled. Concepts in program planning, leadership, and adaptations of activities to special groups. Includes field visitation and analysis of activities.

119 **Creative Dance for Children** (3)

Dance as an expressive art medium for children; concepts, principles, methods, and materials. Emphasis given to dance in elementary education with consideration for special education.

184 **Workshop in Human Kinetics and Leisure Studies** (1 to 3)

May be repeated for credit with permission of advisor.

202 **Conceptual Basis of Motor Learning** (3)

Variables of perceptual motor learning and performance; theories, concepts, and models of learning related to the development of motor skills.

205 **Perceptual-Motor Problems: Diagnostic-Therapeutic Techniques** (3)
(Formerly Diagnostic-Prescriptive Techniques: Perceptual-Motor Domain)

Programs of perceptual-motor development and their theoretical assumptions; diagnostic and remedial techniques.

232 **Current Issues in Elementary School Physical Education** (3)

Current philosophy, trends, and research; implications for curriculum, instruction, evaluation.

239 **Urban Recreation for Special Populations** (3)

Development of recreation for the disabled, impaired, and handicapped using the Baltimore-Washington areas as the urban problem setting; development of competencies in community organization, communications, consultation, group dynamics, and interpersonal relations; program development and evaluation.

240 Physical Education for the Handicapped (3)

Adaptive physical education for handicapped populations; development of competencies in diagnostic-prescriptive teaching, program design and evaluation, consultation, and communications.

244 Therapeutic Recreation Practice (3)

Professional competencies for delivery of services to the handicapped, disabled, impaired; public and private setting for service delivery; client assessment and counseling techniques; basic special education, medical, and rehabilitation terminology; etiology of handicapping conditions as related to recreation.

245 Medical Aspects of Therapeutic Recreation and Adaptive Physical Education (3)

Etiology, symptomology, and treatment of chronic and traumatic disorders associated with handicapping conditions; implications for programming, facility development, and related aspects of therapeutic recreation or adaptive physical education.

250 Administration of Tourism Services (3)

(Formerly Administration of Leisure and Tourism Services)

Planning and organization of a comprehensive system of tourism services utilizing educational, cultural, and recreational resources; emphasis on public relations, personnel administration and supervision, systems analysis, cost-benefit analysis, fiscal management, and managerial accountability.

256 Sports Medicine and Rehabilitation (3)

Theory and practice of therapeutic exercise and recreation as applied to the rehabilitation of the handicapped; injuries; preventive, adapted and remedial concepts; research in area of general rehabilitation practice; professional roles as related to ancillary medical focus.

260 Tourism Development (3)

Theoretical and practical framework for evaluating development models using case studies which highlight existing organizational structures, decision-making systems, and implementation procedures.

280 Advanced Workshop (1 to 3)

Workshops in physical education and leisure studies, dance, and recreation. Emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor.

283 Practicum (3 to 6)

(Formerly Supervised Experience)

Field work, internship and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor.

297 Advanced Topical Studies (3 to 6)

Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. May be repeated once for credit with permission of the advisor.

Italian*

Chairman: G.E. Mazzeo, Professor of Romance Languages; Monroe 429, Telephone 676-6330

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 **First-year Italian** (3–3) (Campus Course)

A year course: credit toward a degree at this University given on completion of Ital 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester.

3–4 **Second-year Italian** (3–3) (Campus Course)

A year course: credit toward a degree at this University given on completion of Ital 4. Conversation, grammar, composition, reading of modern Italian prose, introduction to Italian civilization. Oral practice in language laboratory. Prerequisite: Ital 1–2 or two years of high school Italian. Laboratory fee, $17.50 per semester.

Journalism

Chairman: Philip Robbins, Associate Professor of Journalism; Stuart 301E, Telephone 676–6225

116 **Magazine Layout and Design** (3)

Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry.

145 **Principles and Problems of Public Relations** (3)

Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs.

Law Enforcement Program

Faculty Advisor: Earl H. Williams, Assistant Professorial Lecturer in Forensic Sciences, 2120 L St. N.W., Suite 255, Telephone 676-7124

30 **Introduction to Law Enforcement** (3)

Survey of law enforcement: role of police officers; legal aspects; evidence; court procedures; investigation and crime prevention.

31 **Introduction to Criminal Justice System** (3)

Survey of components of the criminal justice system; the police, prosecution, defense, courts and corrections.

* Administered by the Department of Romance Languages and Literatures.

32 Police Organization and Administration I (3)

Introduction to police organization and administration. Discussion of organization, inspection, training, and the operational services of police departments.

40 Introduction to Industrial Security (3)

Survey of industrial security in the world of commerce. Discussion of the policies, functions, authority and limitations of industrial security personnel.

41 Physical Security (3)

Discussion of physical security policies and procedures in the collection, processing, manufacturing or treatment, storage, transportation and sale of products.

121 Survey of Forensic Science I (3)

Physical evidence in criminal cases: theory, principles, procedures, and techniques of examination of explosives, firearms and projectiles, tools, toolmarks, metallurgy, tire treads, shoe prints, footwear, fingerprint, voiceprint, polygraph, soils, plants, minerals, and plastics.

122 Survey of Forensic Science II (3)

Physical evidence in criminal cases continued: theory, principles, procedures, and techniques of examination of paints, pigments, wood, glass, questioned documents, body fluids, hairs, fibers, arson, toxicology, narcotics, medicolegal evidence, and photography.

123 Criminal Investigation (3)

In-depth analysis and discussion of investigative procedures in criminal cases: interviews and interrogation; surveillance and sources of information; investigation of crimes of violence and fraud emphasizing case-study approach.

131 Police Organization and Administration II (3)

Analysis of organizational structures in small, medium, and metropolitan size police agencies: purpose, functions, and divisions of responsibilities; organizational communication factors. Administrative factors peculiar to police agencies in relationships with local governmental authorities, agencies, and community groups.

141 Criminal Evidence for Police (3)

Comprehensive analysis of the various forms of criminal evidence with emphasis on judicial requirements for the presentation in court of criminal evidence in cases.

142 Criminal Law and Procedure (3)

Analysis of processes and procedures of investigation, indictment, adjudication, sentencing and conviction, and correctional procedures.

151 Criminal Law in the District of Columbia (3)

Comprehensive analysis of the criminal laws of the District of Columbia: judicial interpretations and application of court decisions to law enforcement practices and procedures.

152 Criminal Law in Maryland (3)

Comprehensive analysis of the criminal laws of the State of Maryland:

judicial interpretations and application of court decisions to law enforcement practices and procedures.

153 **Criminal Law in Virginia** (3)

Comprehensive analysis of the criminal laws in the Commonwealth of Virginia: judicial interpretations and application of court decisions to law enforcement practices and procedures.

160 **Presentation of Testimony** (3)

Witness testimony in criminal cases presented in court: rules of evidence (competency, materiality, relevancy); admissibility of testimony; types of witnesses and depths of testimony; and judicial conduct of witness procedures.

162 **White Collar Crime** (3)

Discussion and analysis of the methods, forms, types, operations, and techniques of crimes of fraud, extortion, and intimidation: embezzlement, pilferage, securities, consumers, computers, insurance, bribes and bankruptcy.

163 **Police and Community Relations** (3)

Factors in human relations as they affect policing and police management procedures, practices, and policies. Prejudice and discrimination and their effects on law enforcement agencies and officers in a changing society.

164 **Evidence Photography** (3)

Theories, principles, practices and procedures involved in use of photography in the enforcement of law, investigation of crimes, and documenting scenes and information.

165 **Organized Crime** (3)

Survey and analysis of the origins, organizational structure, functions and actions of organized crime; governmental efforts to combat; and indications of organized crime recognizable by uniformed police officers.

180 **Law of Arrest, Search and Seizure** (3)

Intensive discussion and analysis of the laws of arrest, search and seizure as they affect the private citizenry and police officers; in-depth examination of court decisions (Miranda, etc.). Prerequisites. LEnf 142 and Psc 115.

Management Science

Chairman: J.F. McCarthy, Jr., Associate Professor of Business Administration; Building G205, Telephone 676-7375

118 **Introduction to Information Processing** (3)

Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve flow charting and computer programming in a higher level language (FORTRAN) and are run on the SGBA computer with the School's computer terminals. Laboratory fee, $25 (applicable to off-campus locations having access to the University and SGBA computer centers).

119 Computer Programming for Information Systems (3)

COBOL programming for business and government data processing applications. For students already familiar with basic computer concepts, flow charting, and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 118 or Stat 97. Laboratory fee, $25 (applicable to off-campus locations having access to the University and SGBA computer centers).

120 Information Systems Development I (3) (Campus Course)

Assessment of the systems concept and its relationship to organizational information decision-making and management. Concepts and techniques involved in the initial development of new or revised computer-based information systems, e.g., systems analysis and design phases. Prerequisite: Mgt 118, 119; or permission of instructor. Laboratory fee, $25.

121 Information Systems Development II (3) (Campus Course)

A further examination of the information systems development process, including concepts and techniques for assessment, selection, introduction, operation, and maintenance of a newly designed automated information system. Prerequisite: Mgt 120 or permission of instructor.

122 Special Studies in Information Systems (3) (Campus Course)

An independent or group-study project in information systems development which may involve faculty-supervised research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Prerequisite: Mgt 121 or permission of instructor.

201 Advanced Administrative Management (3)

Integrative approach to organization and management concepts, philosophy and theory as applied to all types of agencies and institutions. Evolution of management thought, functions, and practices in various organizational context. Contemporary issues confronting the manager.

203 Mathematics for Management (3)

Mathematical concepts employed in the solution of management problems. Applications of analytical geometry, functions, elements of calculus, and linear algebra to optimization problems. Prerequisite: knowledge of algebra.

204 Quantitative Factors in Administration (3)

Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application. Breakeven analysis, linear programming, probability, decision-making under uncertainty, queuing models, inventory models.

207 Human Behavior in Organizations (3)

Individual, group, intergroup, and other human behavior and development; application of behavioral science research to administration. Learning exercises and practical applications emphasized. Prerequisite: Mgt 201.

208 Current Issues in Organizational Behavior (3) (Campus Course)

Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and similar problems. Problems in behavioral science research. Prerequisite: Mgt 207.

210 Behavioral Factors in the Process of Change (3) (Campus Course)

Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply their learnings in various settings, and to demonstrate competence in various media. This course emphasizes the relationship between theory and practice. Prerequisite: Mgt 207 or permission of instructor.

212 Organizational Development: Concepts and Methods (3) (Campus Course)

Primarily for doctoral students. Examination of different concepts of organizational structure, processes, and growth. Models of organizational change will be developed with a taxonomy of methods of initiating action to further organizational development. The methods of action, research, team building, confrontation methods, objectives analysis, job restructuring, and other interventions will be related to organizational development processes. Prerequisite: Mgt 207, 210; or equivalent.

213 Consultative Processes in Organizations (3) (Campus Course)

Primarily for doctoral students. Examination through actual practice as well as theory of the nature of the helping process between one person or group and another person or group. Dynamics of the consulting process will be explored as well as role differences in internal and external consultation. Development of skill in the helping relationship will be furthered within the framework of interpersonal relation concepts and laboratory experiences. Prerequisite: Mgt 207, 210; or equivalent.

225 Managerial Statistics I (3)

Mathematics of probability and statistics and application to management science and operations research. Topics include sample spaces, probability models and random variables, discrete and continuous probability distributions, moments and other descriptive measures, sampling theory and practice, and point and interval estimation. Prerequisite: Mgt 203 or equivalent.

226 Managerial Statistics II (3)

Applications of the theory and techniques of mathematical statistics. Topics include hypothesis testing, nonparametric methods, analysis of variance, introduction to statistical decision theory. Prerequisite: Mgt 225.

227 Mathematical Programming: Techniques and Applications (3)

Technical and applied considerations of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of applications of linear programming. Introduction to integer programming, algorithms, and formulations. Prerequisite: Mgt 203 or equivalent.

228 Techniques of Operations Research (3)

Survey and introduction to contemporary operations research techniques, including nonlinear programming, dynamic programming, inventory and queuing models and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 225, 227.

229 Seminar: Management Sciences and Operations Research (3)

Supervised in-depth study and advanced projects in applied operations research. Prerequisite: Mgt 228 or permission of instructor.

240 Survey of Information Technology (3)

Management oriented survey of key areas in information technology. Includes hardware configurations, processing procedures and new developments; software languages, capabilities, procedures and interactive programming; systems technology, analysis, and design; systems concepts, modeling and simulation impact on the organization; EDP management areas, equipment upgrading; replacement and acquisition; personnel practices; budgeting and costing procedures, security of the facility; legislative and social issues, Freedom of Information Act, Family Educational Rights and Privacy Act of 1974; employment patterns, professionalization, shifts in power and value systems. Laboratory fee, $25 (applicable to off-campus locations having access to the University and SGBA computer centers).

241 Management Information Systems Development and Application (3)

Contemporary theories and practices in the development of management information systems. Participation in the design of information systems specifications. The roles of both management and systems design personnel in the systems development process studied and evaluated. Impact of management information systems upon the organization and its decision-making processes evaluated. Case studies. Prerequisite: an introductory course in information technology, or permission of instructor.

242 Comparative Computer Systems (3)

Characteristics and capacities of the range of information processing equipment in use today. Recent and prospective equipment and software development. Selection of computers and related software and equipment. Prerequisite: Mgt 241 or permission of instructor.

243 Management of Information Technology (3)

Advanced course; emphasis on principles, practices, and trends in the management of information technology. Topics include the role and control of an information processing installation; trends, new hardware, and advanced technology in the computing milieu and their implications for information processing management; and analysis of the performance of the data processing activity internally and externally, according to developed criteria. Case studies. Prerequisite: Mgt 241, 242; or permission of instructor.

244 Information Systems and Telecommunication (3)

Principles of telecommunications; the applications of telecommunications for the transmission of data between computers, between humans, between humans and computers. The use of the technology of data communications to enhance the flow of information for management purposes within an organization. Telecommunications terminology, hardware and software considerations, legal and policy issues, recent developments, and calculations necessary for the specification and design of telecommunications systems. Laboratory fee, $25 (applicable to off-campus locations having access to the University and SGBA computer centers).

245 Data Base Management (3)

An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective data base system. Topics include data base organization, creation, and maintenance; effort and economic justification; evaluation criteria; standardization of data base systems; impact of packaged data management systems; and an analysis of the current state-of-the-art in data base development. Students will be-

come proficient in the use of an actual data base management system. Prerequisite: Mgt 119, 241. Laboratory fee, $25 (applicable to off-campus locations having access to the University and SGBA computer centers).

249 **Seminar: Information Technology** (3)

Current problems in the design and implementation of computer supported systems; emphasis on current state-of-the-art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 241, 242, 243; or permission of instructor.

260 **Introduction to General Systems and Cybernetics** (3)

Analysis of fundamental general systems concepts and cybernetic theories evolving in various branches of knowledge and academic disciplines, emphasizing their transcontextual and interdisciplinary nature. Systems approach and general systems frame of reference compared and contrasted. Essential characteristics of and requirements for creation and maintenance of viable systems.

261 **Fundamentals of General Management Systems and Organizational Cybernetics (GEMSOC)** (3)

Dynamics of organization and management from a general systems and cybernetics viewpoint. GEMSOC potential for integrating apparently disparate aspects of organization and management research and theory. Translation of GEMSOC research and theory into the world of organizational behavior and management practice. Prerequisite: Mgt 260.

263 **Case Studies and Field Research in GEMSOC** (3)

Investigations of existing organizational structures and ongoing management processes from a systems and cybernetics viewpoint. Operational evaluations of firms and agencies, including intercontextual comparative studies. Assessments of need for better tools of analysis and synthesis. Prerequisite: Mgt 261.

264 **Organizational Dynamics Simulation and Metasystemic Modeling** (3)

Literature review and current practice analysis. Operation research and conventional modeling techniques, including iconic, analog, and symbolic. Computerized organization dynamics simulation as a management tool. Institutional structure simulation and metasystemic modeling developed by students. Evaluation of organization dynamics modeling and the state-of-the-science and art of computer simulation. Problems and prospects. Prerequisite: Mgt 261.

*280–81
–82 **Managerial Aspects of National Security** (3 or 4-3 or 4-3)

The application of business management principles to the military aspects of national security; organization and administration of the federal government for national defense; management of national resources (natural, human, energy, economic); budgeting and controllership; determination of requirements; procurement; production; supply management; and communications.

* Available only to students in the Master of Science in Administration program at the Industrial College of the Armed Forces.

295 Research Methods (3)

Research techniques, sources of information, array and analysis of data, interpretation and presentation of the findings.

Mathematics

Chairman: T.P.G. Liverman, Professor of Mathematics; Library 719J, Telephone 676-6235

No Mathematics courses numbered 1 to 100 are available for college credit if the student's previous training in mathematics meets the prerequisite for a higher numbered course.

Graduate credit may not be given for Mathematics courses numbered from 101 to 200 without the permission of the Chairman of the Department.

3 College Algebra (3)

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry.

6 Plane Trigonometry (3)

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration).

9 General Mathematics I (3)

For students electing Math 9 and 10 as a terminal sequence. Logic, sets, number systems. Prerequisite: two years of high school mathematics.

10 General Mathematics II (3)

Mathematical systems, geometry, and introduction to statistics and probability. Prerequisite: Math 9.

30 Precalculus (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry.

***31 Calculus of One Variable** (3)

Differentiation and integration of algebraic and elementary transcendental functions, with simple applications. Prerequisite: Math 30 or equivalent.

32 Calculus of Several Variables (3)

Vectors, determinants, partial derivatives, multiple integrals, and infinite series. Prerequisite: Math 31.

33 Calculus of Vector Functions (3)

Curves, differential equations, infinite series, vector calculus, line integrals, Green and Stokes theorems. Prerequisite: Math 32.

***41 Calculus for Economists I** (4)

Differentiation and integration of algebraic and elementary transcendental

* Math 30 may be waived as a prerequisite by examination on scheduled dates.

functions; marginal analysis for functions of one variable; optimization of one variable applied to economics. Prerequisite: Math 30 or equivalent.

42 **Calculus for Economists II** (4)

Elementary linear algebra with economics applications, including input-output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41.

*51 **Mathematics for the Social and Management Sciences I** (3)

Notion of function, graph of function, and sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration.

*52 **Mathematics for the Social and Management Sciences II** (3)

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra, determinants, rudiments of linear programming. Prerequisite: Math 51.

111 **Mathematics for Engineers and Physicists I** (3)

Linear differential equations, linear algebra, Fourier series and integral, nonlinear differential equations of the first order. Prerequisite: Math 32.

112 **Mathematics for Engineers and Physicists II** (3)

Ordinary differential equations, systems of differential equations, boundary-value problems, partial differential equations. Prerequisite: Math 111.

124 **Introduction to Matrix Theory** (3)

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors, Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Prerequisite: Math 32 or permission of instructor.

134 **Introduction to Boundary-value Problems** (3)

Prerequisite: Math 111 or 142 *Theory of Differential Equations.*

139 **Advanced Calculus I** (3)

Review and extension of elementary one-variable calculus, emphasis on the theoretical foundations; differential calculus of several variables. Prerequisite: Math 33.

140 **Advanced Calculus II** (3)

Differential and integral calculus of several variables; contraction maps, implicit function and differential equation theorems. Prerequisite: Math 139 or equivalent.

153 **Introduction to Numerical Analysis** (3)

Introduction to fundamentals of numerical analysis using modern digital computers. Solution of linear systems and of ordinary differential equations. Interpolation polynomials. Iterative solution of nonlinear equations. Simple quadrature techniques. Prerequisite: Math 33 or equivalent.

* Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52.

Music

Chairman: George Steiner, Professor of Music; S–11, Telephone 676-6245

3 Introduction to Musical Understanding (3)

Introductory history of musical styles, related to listening; elements and materials of music.

4 Survey of Music Literature (3)

Introductory study of musical forms, structures, and textures; aural analysis of selected literature.

Oceanography*

Program Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography, Telephone 676-7000 or 946-3557

11 Navigation (3)

Theory of navigation, charts, navigation aids, celestial navigation, shipboard instruments. Prerequisites: college algebra, trigonometry, and Engl 10.

101 Oceanography for Science Majors I (3)

Chemical and physical properties of the oceans; composition of seawater, heat budget, distribution of variables, statics, dynamics, water masses, general circulation of the oceans, underwater sound, and propagation of light. Laboratory and field trips as arranged. Prerequisites or concurrent registration: Math 31, Phys 1 or 3, or permission of instructor.

102 Oceanography for Science Majors II (3)

Physiography and characteristics of the sea floor, ocean basins and margins. Marine biology and ecology. Laboratory and field trips as arranged. Prerequisites or concurrent registration: Geol 1 or 3 or 21; BiSc 11; or permission of instructor.

103–4 General Oceanography (3–3)

(Formerly Introductory Oceanography for Nonscience Majors)

Ocea 103: general circulation of the oceans; waves, tides, and properties of sea water; history and methods. Ocea 104: topography and sediments of the ocean floor; life in the sea; and interrelationships of the marine sciences. Field trips as arranged. Courses may be taken independently.

105 Elementary Geophysics (3)

Gravity geomagnetism, and seismology in cartography, geodesy, and oceanography. Prerequisites: Math 32, Phys 1 or 3.

107 Introduction to Meteorology (3)

An introduction to meteorology including synoptic meteorology, weather forecasting, general circulation of the atmosphere, and air pollution.

*Affiliated with the Department of Geography and Regional Science.

110 Physical Oceanography (3)

Physical properties of sea water, underwater sound, and propagation of light. Currents, heat budget, turbulence, and the general circulation and water masses of oceans. Laboratory and field trips as arranged. Prerequisites: Math 32, Ocea 101, Phys 1 or 3, or permission of instructor.

111 Ocean Waves and Tides (3)

Basic tidal theory; wind waves, seiche, storm surge, and tsunami; analyses and principles of prediction. Field trips as arranged. Prerequisites: Math 32, Ocea 101, or permission of instructor.

112 Biological Oceanography (3)

The study of life in the sea. Biogeography, description, systematics, characteristics of ecology of marine animal and plant groups. Primary productivity and organic food cycles. Biological sampling procedures. Bioluminescence. Symbiotic relationships. Biodeterioration processes and pollution problems. Laboratory and field trips as arranged. Prerequisite: Ocea 102, BiSc 11.

113 Marine Geophysics (3)

Principles of marine geophysical measurements and interpretation. Prerequisites: Ocea 105, Phys 1 or 3.

114 Chemical Oceanography (3)

Chemical processes in the marine environment, including composition of sea water, nutrients, natural composition and variation, carbonate cycle, and extraction. Prerequisites: Chem 12, Ocea 101.

115 Geological Oceanography (3)

Physiography of the sea floor and processes active in ocean basins and margins. Laboratory and field trips as arranged. Prerequisites: Ocea 102, 105, Geol 1 or 3 or 21, or permission of instructor.

120 Coastal Ecology (3)

Coastal ecosystems and how they function; the impact of man's activities. Impact of specific topical activities. Prerequisites: Ocea 101, 102, or 103–4, or permission of instructor.

122 The United States and the Oceans (3)

Tracing the nation's involvements in marine affairs; the effect upon domestic policy regarding alternative ocean uses.

124 Introduction to the Law of the Sea (3)

The changing role of the oceans in international relations: marine activities and ocean law, evolution of the law of the sea since 1960, analysis of major categories of ocean use.

130 Fisheries Biology and Management (3)

Examination of ocean and fresh water yields; emphasis on effect on populations fished, maximum and optimum yields, and how, for whom, and for what purpose fisheries are regulated.

132 Environmental Influences on Marine Living Resources (3)

The relations between living marine resources and the environment. Climate conditions which determine oceanic conditions. The effect of fluctuations in environmental conditions on distribution and/or abundance

of resource species. Prerequisites: Ocea 101, 102 or Ocea 103–4 or equivalent experience.

Oral Biology

Program Advisor: E.A. Caress, Assistant Dean of the Graduate School of Arts and Sciences; Bacon 201, Telephone 676-6210

The courses listed below are open only to students in the program of study leading to the degree of Master of Science in Special Studies with a concentration in Oral Biology. This degree program is offered by the Graduate School of Arts and Sciences in cooperation with the Army Institute of Dental Research at the Walter Reed Army Medical Center (see page 90).

207 **Physical Diagnosis** (1)

208 **Biochemistry** (1)

209 **Pharmacology** (1)

210 **Microbiology** (2)

211 **Biostatistics and Research Methodology I** (2)

212 **Biostatistics and Research Methodology II** (1)

213 **Oral Pathology I** (2)

214 **Oral Pathology II** (2)

215 **Human Anatomy** (1)

216 **Dental Materials** (1)

217 **Dental Behavioral Science** (1)

Pharmacology

Chairman: H.G. Mandel, Professor of Pharmacology; Ross 640, Telephone 676-3541

115 **Drug Abuse Education** (3)

Psychological and sociological bases of drug abuse, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems; legal and societal implications of and reactions to drug abuse. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana and hallucinogenic and psychedelic drugs.

215 **Adolescent Drug Abuse** (3)

Primarily for teachers, counselors, and administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, al-

cohol, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse.

Philosophy

Chairman: R.H. Schlagel, Professor of Philosophy; Rice 611, Telephone 676-6266

50 **Introduction to Philosophy** (3)

Readings from major philosophers and study of philosophic positions from Plato to the present.

111 **History of Ancient Philosophy** (3)

History of Western philosophy from early Greece to the early Middle Ages.

131 **Ethics** (3)

Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems.

162 **Aesthetics** (3)

Nature of aesthetic experience, problems of appreciation and criticism in the arts, and theories of artistic creation.

172 **American Philosophy** (3)

Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought.

193 **Contemporary Philosophy: Phenomenological** (3)

The phenomenological movement, including its development into German and French existentialism, and its more recent phases.

Physics

Chairman: N.K. Khatcheressian, Associate Professor of Physics; Corcoran 102, Telephone 676-6275

ASTRONOMY

9–10 **Introduction to Astronomy** (3–3) (Campus Course)

Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $11 a semester.

PHYSICS

1 **Foundations of Physics** (4) (Campus Course)

Lecture (2 hours), recitation (1 hour), laboratory (2 and one-half hours). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat and electromagnetism, including the clas-

sical concepts of energy, momentum, heat, temperature, entropy, electric and magnetic fields, optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. Laboratory fee, $18.

2 **Introduction to Modern Physics** (4) (Campus Course)

Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of length and time in relativity theory, present understanding of gravitation, wave-particle duality, quantum theory, nuclei, subnuclear particles. Prerequisite: Phys 1 or equivalent. Laboratory fee, $18.

*3 **Foundations of Physics** (3)

Same as Phys 1 without laboratory.

†4 **Introduction to Modern Physics** (3)

Same as Phys 2 without laboratory.

Political Science

Chairman: B. Reich, Professor of Political Science and International Affairs; C–619, Telephone 676-6290

Departmental prerequisite: Two courses selected from PSc 1, 2, or 3 are prerequisite to all second-group courses in political science and service-learning political science.

1 **Introduction to Comparative and International Politics** (3)
(Formerly PSc 5 Introduction to Political Science)

Comparative political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies.

2 **Introduction to American Politics and Government** (3)
(Formerly PSc 6 Introduction to Political Science)

Structure, powers, and processes of the American political system.

3 **Introduction to Political Behavior** (3) (Campus Course)
(Formerly PSc 4 Introduction to Political Science)

Study of political behavior, including the role of politics in today's world, the sources of elite and mass political behavior, and the influence and nature of political institutions.

105 **Political Theory: Major Issues of Western Political Thought I** (3)
(Formerly PSc 117)

Foundations of Western political thought—Plato to Aquinas.

106 **Political Theory: Major Issues of Western Political Thought II** (3)
(Formerly PSc 118)

Philosophical roots of modern political order and disorder—Machiavelli to Rousseau.

* This course may not be taken by students who have completed, or are enrolled in, or plan to enroll in Phys 1.

† This course may not be taken by students who have completed, or are enrolled in, or plan to enroll in Phys 2.

110 **American Political Thought** (3)
(Formerly PSc 119–20)
Political thought in the U.S. from colonial times to the present as seen through major representative writings.

111 **State and Urban Politics** (3)
(Formerly PSc 103 State Politics)
Comparative analysis of context, institutions, processes, and policies of state and urban political systems.

112 **State and Urban Policy Problems** (3)
(Formerly PSc 104 Urban Politics)
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings.

114 **U.S. Constitutional Law and Politics I** (3)
(Formerly PSc 121)
Separation of powers, federal-state relationships, economic regulation.

115 **U.S. Constitutional Law and Politics II** (3)
(Formerly PSc 122)
Political and civil rights.

116 **The American Presidency** (3)
(Formerly PSc 126)
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance.

117 **Public Administration and Bureaucratic Politics** (3)
(Formerly PSc 151 Public Administration and Public Policy-making)
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation.

118 **Legislative Process** (3)
(Formerly PSc 125)
Study of Congress, including theories of representation, legislative power structure, selection of legislators and the roles they play, decision-making, and the relationship between the legislative and executive branches.

119 **U.S. Political Parties and Politics** (3)
(Formerly PSc 145)
Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches.

130 **Comparative Government and Politics** (3)
(Formerly PSc 111)
Comparative political analysis with primary focus on the principal states of Western Europe.

131 **Comparative Government and Politics** (3)
(Formerly PSc 112)
Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe.

140 **International Politics** (3)
(Formerly PSc 171)
International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy.

142 **International Organizations** (3)
(Formerly PSc 172)
Development and operations of the United Nations, regional organizations, and functional international organizations.

144 **Public International Law and Organization** (3)
(Formerly PSc 181)
Survey of international law; emphasis on development and trends.

146 **U. S. Foreign Policy** (3)
(Formerly PSc 167)
Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy.

170 **Governments and Politics of China and Japan** (3)
(Formerly PSc 162 Government and Politics of China)
Political institutions and processes of China since 1949 and of Japan since 1945. Influence of indigenous traditions and foreign contacts.

173 **Governments and Politics of South and Southeast Asia** (3)
(Formerly PSc 193)
Domestic and international politics of the area's major states.

177 **Governments and Politics of the Middle East** (3)
(Formerly PSc 191)
Politics of the eastern Arab states, Turkey, Iran, Israel.

180 **Governments and Politics of North Africa** (3)
(Formerly PSc 192)
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East.

181 **Politics of Middle and Southern Africa** (3)
(Formerly PSc 190)
Comparative analysis of political systems in selected countries of non-Mediterranean Africa.

203 **Public Policy Analysis** (3)
(Formerly PSc 244)
Reading and research on systematic methods of public policy analysis.

204 **Methods of Legislative Research** (3)
(Formerly PSc 242)
The process of empirical research: construction of research design, data collection, and analysis. Techniques discussed will include content analysis, survey research, and analysis of institutional voting.

212 **Urban Politics** (3)
(Formerly PSc 204)
The socioeconomic, demographic, and cultural context of urban politics;

informal patterns of power and influence in urban decision-making; formal institutions and policy-making processes; urban policies and their impacts.

215 **Judicial Policy-making** (3)
(Formerly PSc 222 Judicial Policy-making and Civil Liberties)
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues.

216 **American Presidency** (3)
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making.

218 **Legislative Theory and Behavior** (3)
(Formerly PSc 240)
Organization, behavior, and policy outputs of the U.S. Congress.

219 **American Political Parties and Interest Groups** (3)
(Formerly PSc 245 The American Political Process)
Nature and functions of political parties and interest groups, with special emphasis on the party influences on electoral behavior and congressional decision-making.

220 **Public Opinion and Voting Behavior** (3)
(Formerly PSc 248)
Sources and dynamics of public opinion, political socialization, and voting behavior.

222 **Government, Science, and Technology** (3)
(Formerly PSc 205)
National and international policy issues which arise from the interaction between scientific and technological development and governmental activity.

223 **Science, Technology, and Public Affairs** (3)
(Formerly PSc 206)
Selected public policy issues with significant scientific or technological aspects.

224 **Domestic Policy Analysis—Selected Topics** (3)
(Formerly PSc 249)
Analysis of U.S. policy toward selected domestic problems.

225 **Economic Policy Analysis** (3)
(Formerly PSc 239)
Analysis of selected topics in U.S. monetary and fiscal policy.

226 **Legislative Elements in Economic Policy Development** (3)
(Formerly PSc 247)
Economic analysis of selected legislative issues and the effect of various economic pressures on policy outcomes.

230 **Comparative Government and Politics I** (3)
(Formerly PSc 211)
Examination of basic approaches to comparative politics.

231 **Comparative Government and Politics II** (3)
(Formerly PSc 212)
Comprehensive examination of specific issue areas in comparative political analysis.

234 **Comparative Legislative Systems** (3)
(Formerly PSc 241 Legislative Theory and Behavior II)
Selected problems of legislative theory and behavior from a comparative perspective with particular reference to the parliamentary systems of West Germany, France, and Britain.

246 **U.S. Foreign Policy** (3)
(Formerly PSc 267)
Research and selected reading as the basis for analysis of U.S. foreign policy. Particular reference to the decision-making process and policy execution.

249 **U.S. National Security Policy** (3)
(Formerly PSc 284)
Fundamental considerations; selected issues, e.g., arms control and disarmament, regional security problems, military assistance.

250 **Foreign Policy Analysis—Selected Topics** (3)
(Formerly PSc 259)
Analysis of U.S. foreign policy toward selected world regions.

269 **Soviet Military Policy and Strategy** (3)
(Formerly PSc 288)
Soviet developments in military policy and strategy with attention to intra-bloc military cooperation, political context of Soviet military policy, significant changes in recent Soviet military thought.

286 **Selected Topics in American Politics** (3)
Readings and discussion.

Psychology

Chairman: J.N. Mosél, Professor of Psychology; GG-211, Telephone 676-6320

Departmental prerequisite: Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. Six semester hours in psychology courses are prerequisite to psychology courses numbered above 100. The departmental prerequisite may be waived with the permission of the instructor.

1 **General Psychology** (3)
Fundamental principles underlying human behavior.

8 **Psychology of Motivation and Personality** (3)
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized.

22 **Introduction to Educational Psychology** (3)
The contributions of psychology to education; emphasis on learning.

29 **Psychology of Childhood** (3)

Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world.

101 **Abnormal Psychology** (3)

Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. Prerequisite: six semester hours in psychology or three in psychology and six in a biological science.

112 **Psychology of Adolescence** (3)

Psychological characteristics and problems peculiar to adolescence, with emphasis on application of psychology to solution of such problems.

121 **Psychology of Learning** (3)

Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects.

129 **Theories of Personality** (3)

Survey of personality theories; emphasis on their application to problems of individuals.

131 **Psychological Tests** (3)

Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, $7.

144 **Personnel and Industrial Psychology** (3)

Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity.

145 **Psychology of Management** (3)

Psychological aspects of managing work organizations. Departmental prerequisite waived.

146 **Psychotechnology of Learning and Training** (3)

Psychological principles, concepts, and techniques of human learning and behavioral modification as applied to the design and operation of training and development systems.

151 **Social Psychology** (3)

Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism and war.

156 **Psychology of Attitudes and Public Opinion** (3)

Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare.

175 **Career Development in Youth and Maturity** (3)

Emphasis on the development of long-range career objectives based on review of experiences, the results of psychological testing, seminar discussion groups, and guided independent study. Analysis and practice of the specific skills needed to negotiate for advancement or to accomplish a career change.

191 **Independent Research in Psychology** (3) (Campus Course)

Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit.

211 **Assessment of Cognitive Functioning** (3)

Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Emphasis on evaluation of children. Material fee, $7. Admission by permission of instructor.

246 **Seminar: Personnel Measurement Techniques** (3)

Detailed consideration of techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, and performance ratings.

Public Administration

Chairman: M.M. Harmon, Associate Professor of Management; Government 302, Telephone 676-6295

210 **Concepts and Issues in Public Administration** (3)

Introduction to graduate study in public administration. Professionalism and the public service. Nature of public interest; multiplicity of organizational objectives. Administrative responsibility and individual and organizational ethics. Individual goals and career planning.

213 **Administration in the Federal Government** (3)

Critical analysis of federal administrative organizations as an integral part of the political system. Roles of Congress, the President, the courts, interest groups, political parties, and the public in the public decisional process. Special attention to centripetal and centrifugal forces.

214 **Policy Analysis in Public Administration** (3)

Introduction to systematic analysis of public policy alternatives. Development of conceptual frameworks for differentiating types of public policies, e.g., distributive, regulatory, redistributive; examination of the contribution of economic, quantitative and research techniques to the development, administration, and evaluation of these policies.

223 **Behavioral Factors in Large and Complex Organizations** (3)
(Formerly Behavioral Factors in Large Organizations)

Analysis of the nature and characteristics of large organizations. Bureaucracies and their behavioral patterns; dysfunctionalism. Approaches to policy guidance and leadership, particularly in large public organizations; influence and control systems. Future trends.

231 **Public Personnel Administration** (3)

Survey of basic principles and functions of personnel administration in the public service. Roles of personnel management, recruitment, placement, wage and salary administration, training, retirement, and other personnel functions.

232 **Problems in Public Personnel Management** (3)

Analysis and evaluation of major personnel management problems in government; employee-management relations; interagency and intergovernmental relationships. Impact of automation. Evaluation of personnel systems.

233 **Seminar: Manpower Development and Utilization** (3)

Examination of public and private manpower trends, problems, policies, and programs. Exploration of approaches, old and new, to manpower development and utilization. Analysis of impact of economic, political, and social factors on manpower. Students will select a specific area for individual investigation.

235 **Technology Change and Professional Human Resource Planning** (3)

Research, discussion, and readings dealing with manpower problems arising from automation and other technological changes. Evaluation of these developments in government and business; their implications for productivity, employment, training and education, and personnel and industrial relations. Analysis of economic, political, and social factors influencing public and private manpower policies.

236 **Labor-Management Relations in the Public Sector** (3)

Principles and current issues in public sector labor relations; collective bargaining and the merit concept, scope of bargaining, representation elections, unfair practices, grievance procedures, bilateralism and the management process.

245 **Intergovernmental Relations** (3)

Assessment of the impacts and consequences of changes in the administration of intergovernmental policies and programs in the federal system. Legislation, roles and responsibilities of federal, state, regional and local systems will be examined from both theoretical and practical vantage points to understand their effects.

248 **Financing Local Government** (3)

Analysis of the structure and administration of public finance in local governments. Includes the financing of services through municipal taxation and other revenue sources, debt administration, and implications of the budgetary process.

249 **Urban Public Policy** (3)

Examination of views of the city. Emphasis on urban systems in their social, political, economic, and physical aspects. Against the background of urban politics and administration, will address such central functional areas as health, education, welfare, crime, poverty, transportation and housing.

250 **Administration of State and Local Governments** (3)

Examination of state and local governmental structures and functions, public and private demands, their place within the federal system, their limitations, and alternatives available to encourage more effective administration.

251 **Governmental Budgeting** (3)

Survey of the basic concepts, principles, and practices in governmental budgeting; interrelationship of planning, programming, and budgeting; their role in the management process.

252 **Public Expenditure Analysis and Planning** (3)

Intensive analysis of managerial and economic procedures and techniques used by government agencies for planning, allocating, and managing scarce resources in the achievement of public programs. Topics discussed include benefit-cost analysis, program budgeting, systems analysis, present value analysis, and government contracting.

260 **Policy Formulation and Administration** (3)

Normative and analytical models of the policy process; effects of decision-making and institutional arrangements on public policy formulation and implementation.

262 **Seminar: Science, Technology and Public Policy** (3)

The impact of science and technology upon public administration in terms of both administrative practice and national policies.

295 **Research Methods** (3)

Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings.

299 **Thesis Seminar** (3) (Campus Course)

Examination of thesis standards, research philosophy and methodology in public administration.

300 **Thesis Research** (3)

Religion

Chairman: R.G. Jones, Professor of Religion; O-102, Telephone 676-6325

9 **The Hebrew Scriptures** (3)

Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities.

10 **The New Testament** (3)

Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles.

21 **Religion and Man's Search for Meaning** (3)

Traditional religious concepts, language of contemporary religion amidst modern scientific and secular intellectual tendencies, and the place of religion in today's society.

22 **Religion and Contemporary Social Issues** (3)

Illumination of social problems by ethical reflection; examination of ethical perspectives as stimuli and barriers to social change; techniques for maintaining social values and seeking change.

59 **Religions of the East** (3)
(Formerly History of Religions)

Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto.

60 **Religions of the West and Near East** (3)
(Formerly History of Religions)

History of religion in the ancient world (*e.g.*, Greece) and of Judaism, Christianity, and Islam, including modern developments.

127 **Medicine, Religion, and Healing** (1) (Campus Course)

Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious perspective on issues in medical ethics.

216 **Supervised Clinical Pastoral Education** (I-A) (6)

Full-time program of clinical pastoral education in an approved center. Involvement in the responsibility for pastoral ministry is reviewed and evaluated in a peer-group context.

217 **Supervised Clinical Pastoral Education** (I-B) (6)

A continuation of Rel 216 with emphasis on pastoral and personal identity, sustained pastoral relationships, and pastoral methods and skills.

218 **Supervised Clinical Pastoral Education** (III-A) (6)

Responsibility in pastoral ministry is increased with emphasis on group work, interprofessional involvement, use of specific counseling methods, work with persons with special problems. Prerequisite: Rel 216 and 217; or equivalent.

219 **Supervised Clinical Pastoral Education** (III-B) (6)

Continuation of Rel 218 with emphasis on examination and review of administrative procedures, design of pastoral programs, and development of pastoral theology.

222 **Seminar: Christian Ethics** (3) (Campus Course)

Important tendencies in ethical reflection of the contemporary Christian Church; contributions of social sciences to that reflection.

223 **Religious and Ethical Perspectives on Medical Problems** (3)

Religious and ethical questions in medical problems and medically related issues.

225 **The Dynamics of Ministering to the Young Adult** (3)

Conceptual models of development of young adults from late adolescence; special problems of educational and military experience, vocational choice, marriage and the family, and physical, intellectual, emotional, and religious development. Encounter experience with persons and groups.

227–28 **Advanced Studies in Pastoral Care** (3–3)

History and present state of methodologies and conceptual models of pastoral counseling and leadership in groups; supervised work in interfaith and multidisciplinary ministries.

235 **Seminar: Roman Catholicism in the Modern World** (3) (Campus Course)

Important leaders and their ideas in selected developments since 1500—doctrinal, spiritual, biblical, liturgical, and ecumenical.

237 **Seminar: Theological Analysis** (3) (Campus Course)

Historical and topical study of the development of important ideas in such areas as Christology, soteriology, and ecclesiology.

299–300 **Thesis Research** (3–3) (Campus Course)

Slavic Languages and Literatures

Chairman: G.A. Olkhovsky, Associate Professor of Russian; Library 627, Telephone 676-6335

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 **First-year Russian** (3–3) (Campus Course)

Beginners' course in fundamentals of grammar and pronunciation. Prerequisite to Slav 2: Slav 1. Laboratory fee, $17.50 per semester.

3–4 **Second-year Russian** (3–3) (Campus Course)

Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1–2 or two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, $17.50 per semester.

9–10 **Intermediate Russian Conversation and Composition** (3–3) (Campus Course)

Listening comprehension; oral and written practice. Prerequisite: Slav 4 or 6, or permission of instructor.

91–92 **Introduction to Russian Literature** (3–3)

Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English.

109–10 **Advanced Russian Conversation and Composition** (3–3)

Developing proficiency in oral and written expression. Prerequisite: Slav 10 or equivalent.

161–62 **Russian Culture** (3–3)

Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports.

165 **Soviet Literature from the Revolution to World War II** (3)

Basic themes, issues, literary figures of the Soviet 1920s. The fate of literature and writers under increasing state control; Five-year Plan literature. Lecture, discussion, reports—in English.

166 **Soviet Literature from World War II to the Present** (3)

Literature in wartime, under Stalinism, and in the "thaws." The new gen-

eration of dissident liberals and "underground" literature. Lecture, discussion, reports—in English.

Sociology

Chairman: T.F. Courtless, Jr., Professor of Sociology; D-201, Telephone 676-6345

Departmental prerequisite: Soc 1 is prerequisite to all other courses in Sociology numbered below 200 except for Soc 191.

1 Introductory Sociology (3)
General principles of sociology; development of culture and personality, impact of groups and institutions on social behavior.

2 Major Social Issues (3)
Critical examination of selected major social issues confronting American society. Topics change each semester. May be repeated once for credit. Prerequisite: Soc 1.

101 Development of Social Thought (3)
Examination of concepts and theories relevant to the nature of society and human relationships from ancient writings to the 20th century.

124 Medical Sociology (3)
Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services.

126 Urban Sociology (3)
Place of the city in larger society; growth of the city, problems of urban living, group life, personality, urban housing, city planning, and suburban development.

127 Population Problems (3)
Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control.

129 Race and Minority Groups (3)
Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice.

130 Class, Status, and Power (3)
Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies which affect these distributions.

132 Political Sociology (3)
Analysis of problems involved in the study of power relations in society; distribution of power in society; types and processes of government; political participation and political mobilization.

134 Marriage and the Family (3)
Courtship as a social process, marriage and marital adjustment, development of the family, parent-child relations, family problems, disorganization, divorce, and family reorganization.

135 Juvenile Delinquency (3)

Factors producing delinquency; juvenile detention, the juvenile court, training schools, treatment of offenders.

136 Criminology (3)

Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society.

137 Sociology of Law (3)

Law as a social phenomenon and agency of social control. Problems of legal concepts, doctrines and institution.

139 Society and the Deviant (3)

Analysis of relationships of society, socialization, and deviancy. Social responses to deviancy and criminal offenders; rehabilitative programs in community, courts, and schools.

140–41 Social Research Methods (3–3)

Soc 140: introduction to basic research methods in sociology. Soc 141: advanced research methods. Prerequisite to Soc 141: Soc 140.

143 Social Movements (3)

General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions.

144 Public Opinion and Mass Communication (3)

Communication process with emphasis on international communications, propaganda, and mass media; measurement of propaganda campaigns.

149 Modern Sociological Theory (3)

Systematic study of contemporary schools of sociological theory, both European and American development; evaluation of scientific contributions of each school. Prerequisite: Soc 101.

153 Poverty in America (3)

155 Women, Sex Roles, and Socialization (3)

Analysis of the social-structural and personality theories and empirical research on sex-role socialization in contemporary society. Topics include sexual inequality, women's changing place in the occupational structure, and social change and the women's movement .

160 Death and Dying: A Sociological Perspective (3)

Processes of death and dying examined from cross-cultural and national perspectives. Topics include considerations of terminal care, abortion, murder, funeral customs, genocide, and the depiction of death in literature and philosophy.

191 Current Emphases in Sociology (3)

Analysis and evaluation of recent developments in the general field of sociology. Topic changes each semester; may be repeated for credit.

201 Concepts of Sociology (3)

Systematic survey, critical analysis of sociological concepts. Emphasis on

theoretical systems. Topic changes each semester; may be repeated for credit. Admission by permission of instructor.

202 **Uses of Sociology** (3)

Examination of empirical research based upon theoretical perspectives introduced in Soc 201. An introduction to social research methods.

210 **Theoretical Foundations of Political Sociology** (3)

Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict, and change.

211 **Seminar: Social Change** (3)

Comparative study of political processes concentrating on political development in Third World Nations.

228 **Introduction to Urban Social Problems** (3)

Analysis of urban social theories and paradigms used in urban analysis; historical development of urban centers, including growth, development and change in society's perceptions of problems; examinations of legislative changes and policy making as they apply to urban areas.

229 **Analysis of Urban Social Problems** (3)

Examination of specific urban social problems. Effects of density on populations, demographic changes in population, poverty in relation to urban problems, child abuse and family problems, prognosis for future of urban areas.

240 **Sociology of Work and Occupations** (3)

Analysis of occupational roles and structures; recruitment and training; adjustment problems at various career stages; interrelationships of stratification, life styles, and work roles.

248 **Seminar: Organizational Theory and Behavior** (3)

Advanced analysis of theory and behavior in complex organizations relative to defining organizations, examining basic social processes and their relationship to the cultural environment.

252 **Seminar: Sociology and Social Policy** (3)

254 **Seminar: Methods in Social Policy Research** (3)

Systematic survey of conceptualization, design and practice of evaluation research of social experiments, and of simulation and technological forecasting. Prerequisite: Stat 105, Soc 230, 252; or permission of instructor.

*259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) (Same as Law 475[2])

*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) (Same as Law 476[2])

* Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to one additional semester hour. For description of the courses, see the *National Law Center Bulletin*.

262 **Seminar: Police and the Community** (3)

Analysis of contemporary urban law enforcement, including policing "styles," civil disorder, police-community relations, and competing perspectives on the place of police agencies in civil society.

263 **Seminar: Law and Society** (3)

Selected problems in law as instrument of social policy; emphasis on the organization of legal decision-making processes.

270 **Educational Sociology** (3)

Analysis of educational systems from institutional perspectives and as agencies of socialization; relationships of education in general to society, including technological, communal, and subcultural components.

271 **Sociology of the Youthful Offender** (3)

Factors producing delinquency, juvenile detention, the juvenile court, training schools, treatment of offenders.

272 **Social Disorganization** (3)

Analysis of factors contributing to disruption of social groups, institutions, and communities; study of attempts to establish social controls to prevent, minimize, or mitigate the effects of socially disruptive conditions and events.

273 **Deviant Behavior** (3)

Analysis of relationships of society, socialization, and deviancy. Social responses to deviancy and criminal offenders; rehabilitative programs in community, courts, and schools.

274 **Human Sexuality** (3)

A synthesis of theoretical perspectives from which analysis of various forms of sexual behavior and problems related to sexuality will be undertaken.

Spanish*

Chairman: G.E. Mazzeo, Professor of Romance Languages; Monroe 429, Telephone 676-6330

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 **First-year Spanish** (3–3) (Campus Course)

A year course: credit toward a degree at this University given on completion of composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester.

3–4 **Second-year Spanish** (3–3) (Campus Course)

A year course: credit toward a degree at this University given on completion of Span 4. Conversation, grammar, composition, reading of modern

* Administered by the Department of Romance Languages and Literatures.

Spanish prose. Oral practice in language laboratory. Prerequisite: Span 1–2, or two years of high school Spanish. Laboratory fee, $17.50 per semester.

Special Education

Chairman: P. Botwin, Professor of Special Education; C-429, Telephone 676-6170

200 **Psychosocial Development of Young Exceptional Children** (3)
(Formerly Understanding Young Exceptional Children)
A course designed to illuminate the complex and interactive processes which exist in the relationship between psychosocial development and the developmental process.

201 **Introduction to Special Education** (3)
Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accommodate children in a school program.

222 **Special Education in the Regular Classroom** (3)
Special techniques and materials for regular classroom teachers to assist children who have learning and/or behavior problems; emphasis on specific, practical strategies and applications. Open to undergraduate seniors and regular classroom teachers.

230 **Vocational Assessment of the Secondary Level Handicapped Student** (6)
Individual study of methods and materials used in vocational assessment including formal and informal tests to determine vocational interests and aptitudes, academic performance, learning style and behavioral readiness.

231 **Selected Vocational Methods and Materials** (3)
Selected materials and techniques used in teaching and programming for the secondary school level handicapped person in academic, career, leisure, and occupational skill areas.

232 **Practicum: Vocational/Special Education** (3)
Placement in at least three to five different sites offering programs in the areas of pre-vocational, industrial arts, and vocational programming that serve the adolescent student.

233 **Curriculum for Vocational/Special Education** (3)
Examples and practice in designing and implementing academic, self-help, career education, pre-vocational, industrial arts, and vocational curriculum skills for the handicapped.

234 **Seminar in Vocational/Special Education** (3)
Weekly seminar dealing with experiences, problems, and concerns encountered during the internship with handicapped adolescents. Must be taken concurrently with SpEd 295.

235 **Coordination of Job Placement Programs in Vocational/Special Education** (3)

Examples and programming considerations for the development and coordination of an adolescent job placement program.

236 **Postsecondary Career Planning for the Handicapped** (3)

This course will address the on-going process of career decision making by the handicapped person who is completing a secondary school level program.

250 **Specialized Techniques and Materials for Diagnostic-Prescriptive Teachers** (3)

Selected materials and techniques used in diagnostic-prescriptive teaching. Must be taken concurrently with SpEd 252. Admission by permission of instructor.

251 **Psychosocial Factors in Special Education** (3)

Psychosocial factors significant to the process of the special education school-based consultant. Admission by permission of instructor.

252 **Practicum for Diagnostic-Prescriptive Teachers** (6)

Supervised school experience in diagnostic-prescriptive teaching. Must be taken concurrently with SpEd 250. Admission by permission of instructor. A minimum of 280 clock hours required.

253 **The Humanizing Curriculum and the Special Education Consultant** (3)

Curriculum concepts and modification aimed at enhancing the classroom environment for learning and growth. Admission by permission of instructor.

260 **Developmental Assessment of Young Exceptional Children** (3)
(Formerly The Assessment Process: Identification and Psycho-educational Assessment of Young Exceptional Children)

Lectures, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor.

261 **Practicum: Methods and Materials for Young Exceptional Children** (3)

Clinical practice in design and implementation of educational strategies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Taught at a demonstration site. Requiries eight hours a week in service.

262 **Seminar: the Education of Young Exceptional Children** (3)

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship for the education of young exceptional children. Must be taken concurrently with SpEd 292. Admission by permission of instructor.

263 **Introduction to the Education of the Severely and Multiply Handicapped Child** (3)

Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experience.

264 **Advanced Study in the Special Education of Severely and Multiply Handicapped Children** (3)

Specialized programs, techniques, and methods for teaching children with severe disabilities.

266 **The Development of Language in Young Exceptional Children** (3)

(Formerly Problems in Language Development in Young Exceptional Children)

Introduction to the study of language acquisition and the application of current research on language of handicapped children.

267 **The Early Childhood Special Educator: A Survey of Roles and Services** (3)

(Formerly The Role of the Early Childhood Special Educator)

Examination of the spectrum of roles available in early childhood special education; emphasis on role expectations and psychosocial dynamics of the various settings.

268 **The Development of Young Exceptional Children with Emphasis on Handicapped Conditions** (3)

Lecture (2 hours), site visitation (3 hours), discussion (1 hour).

269 **Multi-Disciplinary Theory in Special Education** (3)

(Formerly Psychosocial Concerns of the Early Childhood Special Educator)

Seminar involving student presentations focusing on sociological and psychological constructs relevant to interpersonal/intrapersonal relationships.

270 **Adapting the Early Childhood Curriculum to the Young Exceptional Child** (3)

(Formerly Adapting the Early Childhood Curriculum to Meet Special Needs)

Review of the basic curriculum areas as they relate to the development of readiness skills in special education.

271 **The Interdisciplinary Approach to Planning for the Severely or Multiply Handicapped Child** (3)

Laboratory experience in which students participate as educational members of an interdisciplinary team.

273 **Seminar for Special Education Strategist Intern** (3)

Weekly seminar dealing with experiences, problems, and concerns encountered during special education/early childhood strategist internship. Concurrent enrollment in SpEd 293 required.

290 **Control and Management Techniques for the Young Exceptional Child** (3)

(Formerly Control and Management Techniques in the Classroom)

Examination of the theory, techniques, and tools essential for group control. Designed to provide practice as well as familiarity with the various theories of control of human behavior. Admission by permission of instructor.

291 **Internship in Crisis-Resource Teaching** (6–9)

Supervised field experience in the crisis-resource teacher program. Under

the direction of a qualified teacher and the supervision of the University staff. Minimum of 420 clock hours required.

292 **Professional Internship in Education of Young Exceptional Children** (9)

Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. Must be taken concurrently with SpEd 262.

294 **Internship in Diagnostic-Prescriptive Teaching** (9)

Supervised field experience in diagnostic-prescriptive teacher programs. A minimum of 420 clock hours required. Admission by permission of instructor.

295 **Professional Internship in Vocational/Special Education** (9)

Supervised internship in the vocational/special education of adolescent handicapped youth, emphasizing the diversified, multi-dimensional, and inter-agency cooperative needs for such programming. A minimum of 420 clock hours is required. Must be taken concurrently with SpEd 234.

303 **Administration and Supervision of Special Education** (3)

Philosophy and nature of special education; litigation, program organization, administration, and development. Surveying local-level needs; program evaluation and supervision. Admission by permission of instructor.

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3)

Theoretical foundations and clinical techniques necessary for the early childhood special educator to successfully counsel parents of handicapped children.

350 **The Diagnostic-Prescriptive Teacher** (3)

Rationale, operational models, techniques, and problems relevant to implementation of diagnostic-prescriptive teacher programs. Admission by permission of instructor.

351 **Seminar: School-based Consultants in Special Education** (3)

Current practices in regular and special education as they affect the school-based consultant; emphasis on concurrent field experience. Admission by permission of instructor.

352 **Seminar: Special Education Consultant Programs in the Schools** (3)

For school-based consultants in special education; focuses on in-school program development and recent trends in processes and procedures. Admission by permission of instructor.

360 **Advanced Techniques in the Diagnostic-Assessment Process** (3)

Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent.

370 **Intrapersonal Dynamics in Special Education** (3)

Small group exploration of intrapersonal factors essential to understanding roles and interpersonal techniques in teaching exceptional children. Admission by permission of instructor.

Speech and Drama

Chairman: L.S. Bowling, Professor of Speech and Hearing, Auditorium 6, Telephone 676-6350

1 Communicative Speaking and Listening (3)

Basic theories and principles of speech communication; composition, delivery, and criticism of speaking in interpersonal, group, and public situations. Recording fee, $4.

11 Voice and Diction (3)

Development of naturalness, correctness, and clarity in conversational speech. Analysis and correction of individual speech delivery faults through tapes and weekly performances. Recording fee, $4.

32 Oral Interpretation of Literature (3)

Practical work in translating literature into the spoken word. Interpretation of prose, poetry, and drama. Recording fee, $4.

45 Understanding the Theater (3)

The art of the theater; its literature, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer examined through lectures and class discussions. Attendance at theatrical performances and presentations by visiting artists.

•111 Business and Professional Speaking (3)

Study of the communication process in business and professional speaking; practice in presenting technical reports; selling policies, programs, and services; interviews; conferences; speech in training and supervisory activities. Primarily for nonmajors.

121 Group Discussion and Conference Leadership (3)

Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prerequisite: SPDR 1 or permission of instructor.

Statistics

Chairman: S.W. Greenhouse, Professor of Statistics; C-311, Telephone 676-6356

Departmental prerequisite: One entrance unit in algebra is prerequisite to courses in Statistics numbered below 100.

†‡51 Introduction to Business and Economic Statistics (3) (Campus Course)

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation, time series, index numbers. Laboratory fee, $18.

• This course can be adapted to the needs of a specific group.
† Stat 101, which is offered off campus, may be substituted.
‡ Stat 51, 54, and 101 are related in their subject matter, and credit hours for only one of the three may be applied toward a degree.

*54 **Introduction to Statistics in Social Science** (3)
(Formerly Stat 53)
Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. Laboratory fee, $18.

*101–2 **Basic Principles of Statistical Methods** (3–3)
Variables and attributes, averages and dispersion, elementary principles of sampling, introduction to the making of statistical decisions. Prerequisite to Stat 102: Stat 101.

105 **Statistics in the Behavioral Sciences** (3) (Campus Course)
(Formerly Statistics in the Behavioral Sciences and Education)
Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53 or 54, or equivalent and satisfactory performance on a placement examination. Laboratory fee, $18.

107 **Statistics for Engineers** (3)
Probability models, discrete and continuous distributions, sampling, hypothesis testing and estimation, engineering applications. Prerequisite: differential and integral calculus.

111 **Business and Economic Statistics I** (3) (Campus Course)
Statistical methods used in economics and business.

112 **Business and Economic Statistics II** (3) (Campus Course)
Case work to illustrate quantitative procedures for solution of economic and business problems. Prerequisite: Stat 111 or equivalent.

127 **Statistics for the Biological Sciences** (3)
Introduction to statistical techniques and reasoning applicable to the biomedical and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design.

Telecommunication Operations

Faculty Advisor: D.A. Rowley, Associate Professor of Chemistry; Bacon 201, Telephone 676-6210

240 **Seminar in Telecommunication Policy and Regulations** (3)
International and domestic telecommunications institutions; the policy and regulatory process; spectrum management; cable telecommunications systems; common carrier/microwave transmissions system; mobile system; broadcasting-AM, FM, UHF, VHF-TV; satellites; United States domestic satellites; mobile satellite system; international telecommunications law; environmental impact; United States government systems; INTELSAT.

* Stat 51, 54, and 101 are related in their subject matter, and credit hours for only one of the three may be applied toward a degree.

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